Allen-Bradley

WeighScale Module

(Cat. No. 1771-WS)

User Manual

Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation, and Maintenance of Solid-State Control* (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

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Throughout this manual we use notes to make you aware of safety considerations:

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss.

Attention statements help you to:

- identify a hazard
- avoid the hazard
- recognize the consequences

Important: Identifies information that is critical for successful application and understanding of the product.

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Summary of Changes

The information below summarizes the changes to WeighScale Configuration software since the last release. Revision bars in the page margins indicate updated information.

New Information

The table below lists new features and shows where to find this new information.

for this new information	see chapter
using the ladder logic utility and interface to the MMI	3
how the software is supplied	4
supervising security	5
managing projects	6
managing modules	7
configuring the module	8
calibrating the module with the calibration wizard	9
using the software to monitor module status	10
viewing or printing reports	11
writing custom ladder logic	A
editing the configuration/calibration block	B
monitoring module status without using WeighScale Configuration software	C
specifications	D

Notes:

Using this Document

This preface describes how to properly and efficiently use this document. It tells you about:

- purpose of this document
- who should use this document
- what this document contains
- getting help
- conventions
- vocabulary
- Rockwell Automation support

Purpose of this Document

This document shows you how to

- use your Weigh Scale Module (cat. no. 1771-WS) in an Allen-Bradley PLC-5® programmable controller system
- use WeighScale Configuration software (provided separately from the module) to configure, calibrate, monitor, and control your module

Who Should Use this Document

This document assumes that:

- you can program and operate an Allen-Bradley PLC-5 programmable controller
- you can program block transfer instructions
- you are familiar with Microsoft® Windows 3.1, 95 or NT™ and are familiar with terms that describe what you should be doing when working in Windows, e.g., double-click, radio checkbox

What this Document Contains

This document contains 11 chapters and 4 appendices:

to	see this chapter	
learn about process weighing and module features	1	Overview of the Weigh Scale Module
install the module and learn about: • module power requirements • keying • chassis location • wiring of module and remote termination panel	2	Installing the Module
• use the ladder logic utility to minimize programming • use the interface to the MMI	3	Using the Ladder Logic Utility
• install WeighScale software • learn about hardware requirements for your computer • learn about software requirements for your computer • start the software • use online help	4	Getting Started with WeighScale Configuration Software
• learn about control of security • select privilege categories • add and delete users • edit privileges • change passwords • enable security • login and logout	5	Supervising the Security System
• create project files • work with project files	6	Managing Projects
• add modules to a project • move a module from one project to another • modify the Module List screen	7	Managing Modules
• use the Module Configuration screen • configure the module	8	Using WeighScale Configuration Software to Configure the Module
• learn about which type of calibration is best for your application • access the Calibration wizard • calibrate the module • restore the calibration • read resistance to test the module	9	Using WeighScale Configuration Software to Calibrate the Module
• access the Monitor screen • view or enter data	10	Using the Module Monitor Screen
view or print descriptive reports	11	Documenting Projects
learn procedures that you can use to isolate problems	12	Troubleshooting the Module

to	see this appendix
write custom ladder logic to: •address the module •select weight values •program your ladder logic	A Writing Custom Ladder Logic
calibrate the module by directly manipulating the configuration/calibration block	B Editing the Configuration/Calibration Block
monitor status data by reading information directly from the data table: •read 6-digit integer values •read floating point values •learn about the implied decimal point •learn about the status block	C Monitoring Status Data
obtain information to install and use the WeighScale module	D Specifications

In addition, we have included a Glossary that lists and defines terms you'll need to understand to use the Weigh Scale Module and WeighScale software.

Getting Help

You can get online help on the Weigh Scale Module and WeighScale software. (See Chapter 4 of this manual for more on WeighScale online help.) In addition, you can refer to these documents for help on INTERCHANGE™ and RSLinx™ software and PLC processors:

publication name	publication number
Enhanced and Ethernet PLC-5 Programmable Controllers User Manual	1785-6.5.12
PLC-5 Programmable Controllers Quick Reference	1785-7.1
INTERCHANGE Software for Windows User Manual	5850-6.5.2
INTERCHANGE Software for Windows Release Note	5850-6.5.2-RN1, -RN2
RSLinx OEM User's Guide	Doc ID 9399-WABOUG
Device Configuration Utility User Manual	5850-6.5.7
PLC-5 Programming Software (Release 5.0) Instruction Set Reference Manual	1785-6.1

For a list of publications with information on Allen-Bradley programmable controller products, consult the Allen-Bradley Publication Index, publication SD499.

Conventions

We use these conventions in this document:

this convention	is used to
	call attention to helpful information
	alert you to information that you should read, or procedures that you should follow, before proceeding
	refer you to other Allen-Bradley documents that might be useful

Also, we use these conventions to picture data entry and displays:

this convention	represents
	keystroke commands
`c:\abic\run`	text that you need to type

These instructions assume the 3½-inch disk is to be inserted into drive ***a*** of your computer. If drive ***a*** is not used, replace the ***a*** in these instructions with the appropriate drive designation.

Vocabulary

In this document, we often refer to:

- the Weigh Scale Module as the *1771-WS Module* or as the *module*
- the programmable controller processor, as the *PLC® processor* or the *processor*
- a transducer (sensing element) that measures an applied load by a change in its electrical output signal as a *load cell.*

  An exception is our reference to a C2™ Second-Generation-Calibration *load point* to reflect the term used by the manufacturer of that specific device. Some manufacturers of load cells refer to them as load points or weigh modules.
- Data Highway Plus™ network as the *DH+™* network

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Glossary

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Overview of the Weigh Scale Module

This chapter provides an overview of the WeighScale module.

What Is the Weigh Scale Module?

Series B only

WeighScale configuration software is *NOT* included with the module. You must obtain it separately. We tell you how in Chapter 4, "Getting Started with WeighScale Configuration Software".

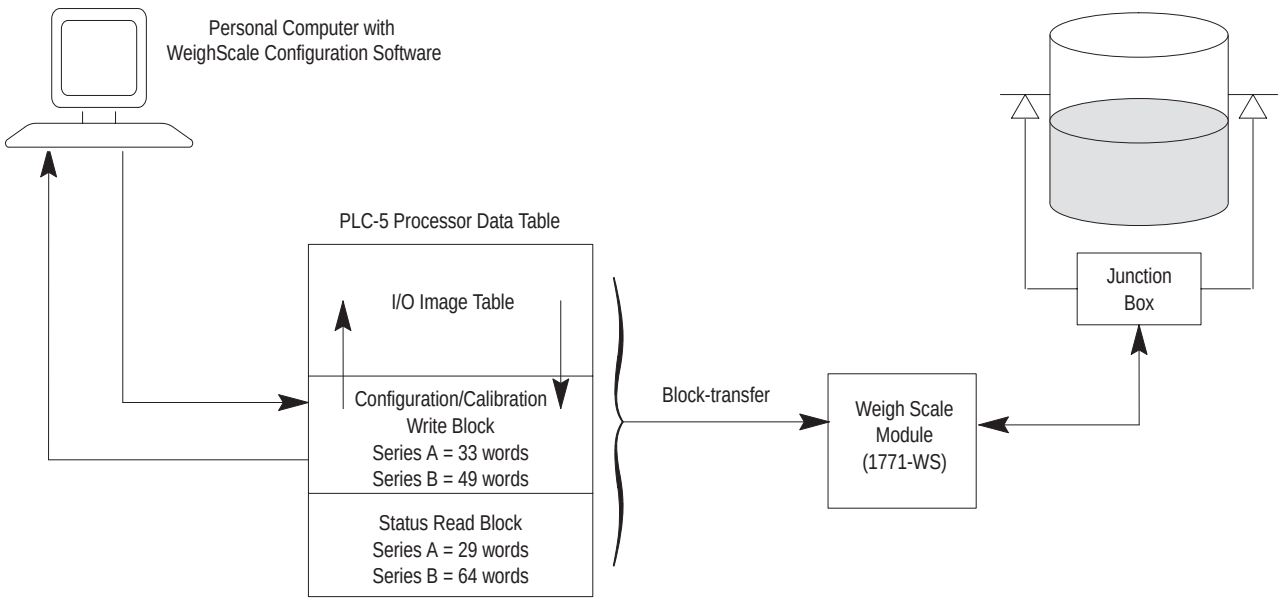
The Weigh Scale module (1771-WS) is an intelligent I/O module that reads values from industry-standard strain-gage load cells. The module accepts analog weight values directly from a single load cell or the sum of the values from two, three, or four load cells connected through a junction box.

You can use as many as eight load cells with the module. You will need an external power supply for five or more load cells.

The module receives block-transferred configuration and calibration values from the PLC-5® data table. The module block-transfers the weight values and other status values to a PLC-5 processor.

The WeighScale module can work without WeighScale Configuration software (interacting directly with the PLC processor). However, we recommend that you use the software to set up and maintain the module.

You install WeighScale software on a personal computer in a DH+™ network with the PLC-5 processor. If you are using RSLinx software as a man-machine-interface (MMI), you can connect the personal computer to the PLC processor with an Ethernet link. You can then enter configuration and calibration values on easy-to-use screens.



Compatibility Issues

Compatibility involves previous releases of the module, data table use as well as compatibility with I/O chassis, remote termination panels, and processors.

Compatibility with Earlier Versions of the Module

A jumper setting (J1) you can change lets you configure the module for Series A (single density) or Series B (double density) operation. Functional modifications made to the Weigh Scale Module for Series B do not affect how the module operates in Series A mode. You can complete any tasks you performed using earlier versions of the module.

To configure the jumper, see Chapter 2 of this manual.

If you set the jumper for Series B (double density) operation:

- you can now download setpoint, preact, and deadband values to the module
- the module compares weight data to the setpoint and preact values. When the weight data reaches the preact value, the module sets a discrete bit in the PLC input image table without a block-transfer read
- we now return rate-of-change data in the block-transfer-read data block
- we also return all configuration data in the block-transfer-read data block

A separate change to the real-time sampling period affects both new and old versions of the Weigh Scale Module:

- When the PLC processor requests a block-transfer read, the Weigh Scale Module responds only if the real-time sampling period value has elapsed since the last block-transfer read
- When the data transfer occurs, the data in the PLC data table is the most recent information processed by the module

Data Table Use

Communication between the module and the processor is bi-directional, using both block transfer reads (BTRs) and block transfer writes (BTWs). The module uses a byte in the output image table and a byte in the input image table. The module also requires an area in the data table to store the block-transfer read and write data.

I/O image table use is an important factor in module placement and addressing selection. We show the module's data table use in the following table.

		Use of Data Table				Compatibility			
Catalog Number	Series	Input Image Bits	Output Image Bits	Read-Block Words	Write-Block Words	Addressing			Chassis
						1/2-slot	1-slot	2-slot	
1771-WS	A (single density)	8	8	29	33	Yes[1]	R1[2]	R2[3]	B[4]
	B (double density)	8	8	64	49	Yes[1]	R1[2]	No	B[4]

1 Yes = Compatible without restriction.

2 R1 = Restricted compatibility; it cannot be in the same even/odd pair of slots with a 32-bit module.

3 R2 = Restricted compatibility; it cannot be in the same even/odd pair of slots (I/O group) with a 16-bit module.

4 B = Compatible with 1771-A1B, A2B, A3B, A3B1, A4B, 1771-AM1, -AM2 chassis.

You can place your 1771-WS module into any I/O module slot of the I/O chassis.

I/O Chassis

This module can only be used in 1771-A1B, A2B, A3B, A3B1, A4B, -AM1, and -AM2 chassis.

Remote Termination Panel

The 1771-WS module is compatible with the 1771-RT44 remote termination panel, which you must purchase separately.

Processor

The 1771-WS module is compatible with 1785 PLC-5 processors.

Features of the Weigh Scale Module

The 1771-WS module provides:

- weight values in either pounds or kilograms
- weight values in both 16-bit integer and 32-bit floating-point format
- the ability to tare or zero the scale
- compatibility with 3mV/V and 2mV/V industry-standard load cells and C2 Second-Generation-Calibration load points
- 20-bit A/D conversion — providing 985,000 counts of displayed resolution over the 0-30mV range
- 50ms A/D conversion period
- a “weight-in-motion” status indication
- Hardy Instruments WAVERSAVER™ technology to filter out mechanical vibrations and noise from the weight values
- 3 ways to calibrate the module:
  - hard calibration
  - soft calibration — to minimize the need for test weights when used with load cells of known sensitivity and range
  - C2 calibration — to minimize the need for test weights and eliminate the need for manual entry of values when used with C2 Second-Generation-Calibration load points
- non-volatile on-board flash memory — to store calibration values
- restoration of calibration values from PLC® data table to non-volatile on-board memory — lets you to quickly switch the calibration values to those of another scale, or to restore them after replacing a module
- stand-alone Windows-based (v3.1, v3.11, NT and 95) WeighScale Configuration software — to provide configuration and calibration without ladder logic programming software
- on-board diagnostics
- setpoints, deadbands, and preacts — let you download values to the module so that the module can compare the scale to the setpoints without waiting for the PLC processor to cycle through ladder logic that depends on block transfers
- rate-of-change in weight data — based on user-defined time units, evaluation period, and unit of measure
- configuration data — lets you view configuration data in the block-transfer read data block

What to do Next

To help learn how to install the Weigh Scale Module, read Chapter 2, “Installing the Module.”

Installing the Module

This chapter tells you how to install the WeighScale module.

Preventing Electrostatic Damage

Electrostatic discharge can damage semiconductor devices inside this module if you touch backplane connector pins or jumper pins. Guard against electrostatic damage by observing the following warning:

ATTENTION: Electrostatic discharge can degrade performance or cause permanent damage. Handle the module as stated below:

- Wear an approved wrist-strap grounding device when handling the module
- Touch a grounded object to rid yourself of electrostatic charge before handling the module
- Handle the module from the front, away from the backplane connector. Do not touch backplane connector pins

Preparing to Install the Module

Before installing your module in the I/O chassis you must:

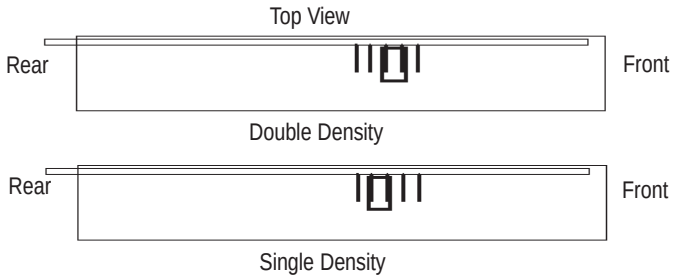
to	see page
set the jumper for single- or double-density mode	2–2
calculate power requirements for the I/O chassis	2–3
determine module location in the I/O Chassis	2–3
determine remote termination panel location	2–4
plan for sufficient enclosure depth	2–4
key the I/O chassis for your module	2–5

Set the Jumper for Single Density or Double Density Mode

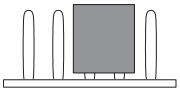
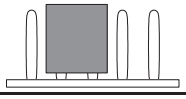
When you received the module, the J1 jumper was configured for Series B or double density mode. (The Series B module has a label on its side.) You can set the jumper for single (Series A) or double density (Series B) mode.

if you select	then
single density (Series A)	the module has Series A functionality
double density (Series B)	you can: • use setpoint parameters • retrieve rate-of-change values • verify configuration data

Remove the module cover to access the J1 jumper.



Then set the jumper as shown in the following illustration.

to set the module for this mode	set the J1 jumper to look like this
single density (Series A)	
double density (Series B)	

Calculate Backplane Current Load for the I/O Chassis

Your module receives its power through the 1771 I/O chassis backplane from the chassis power supply. The maximum backplane current load of the module is 1.5A.

Add this load to the loads of all other modules in the I/O chassis. This total must not exceed the chassis backplane or backplane power supply load specification.

Determine I/O Chassis Addressing Mode

Your J1 jumper selection determines the addressing mode of the Weigh Scale Module:

If the jumper is set for this mode:[1]	The module is compatible with this addressing:		
	$^1/_2$-slot	1-slot	2-slot
single density	Yes	rack 1	Yes
double density	Yes	Yes	No

[1] If the jumper is not present, the module is compatible with $^1/_2$-slot, 1-slot, and 2-slot addressing and defaults to Series A functionality.

When the J1 jumper is set for double density (Series B) operation, the module is not compatible with two-slot addressing.

Determine Module Location in the I/O Chassis

The extreme left slot is not an I/O module slot; it is reserved for processors or adapter modules:

- If you are using ½-slot addressing, you can place your module into any I/O module slot of the I/O chassis
- If you are using 1-slot addressing, do not place the 1771-WS module into the same even/odd module-slot pair with a 32-bit-density module. This module uses the input image table and the output image table
- To minimize electrical noise interference, group analog and low-voltage dc digital modules away from ac modules or high voltage dc digital modules

Using earlier versions of the module

If you are using a version of the module earlier than Series B (or a Series B module set for Series A mode) and are using 2-slot addressing, do not place the 1771-WS module into the same I/O group (even/odd module-slot pair) with a 16-bit-density module. This module uses a byte in the input image table and a byte in the output image table.

Determine Remote Termination Panel Location

Place your 1771-RT44 remote termination panel in close proximity to the module so that the distance is within the length of the interconnect cables you choose:

- The length of the 1771-NC6 cable is 1.8m (6 feet)
- The length of the 1771-NC15 cable is 4.6m (15 feet)

Plan for Sufficient Enclosure Depth

The cable connector sticks out from the front of the module. The enclosure must provide room for a total of 215 mm (8.5 inches) from the back-panel to the connector.

Key the I/O Chassis for Your Module

To key the I/O slot to accept only this type of module, use the plastic keying clips shipped with each I/O chassis.

ATTENTION: Observe the following precautions when inserting or removing keying clips:

- insert or remove keying clips with your fingers
- make sure that keying placement is correct

Incorrect keying or the use of a tool can result in damage to the backplane connector and possible system faults.

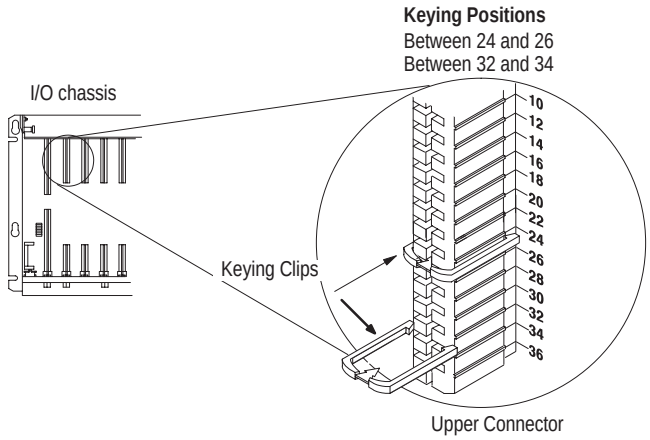
I/O modules are slotted in two places on the rear edge of the circuit board. The position of the keys on the backplane connector must correspond to these slots to allow insertion of the module. You can key any I/O-module-slot connector in an I/O chassis to receive this module. Place keying clips between the following numbers labeled on the upper backplane connector: (See Figure 2.1.)

- Between 24 and 26
- Between 32 and 34

You can change the position of these keys if subsequent system design and rewiring makes insertion of a different type of module necessary.

ATTENTION: Insert or remove keying bands with your fingers.

Figure 2.1
Keying Positions



Installing the Module

When installing your module in an I/O chassis:

1. Turn off power to the I/O chassis.

ATTENTION: Remove power from the 1771 I/O chassis backplane and disconnect the cable from the module before removing or installing an I/O module.

Failure to remove power from the backplane could cause injury or equipment damage due to possible unexpected operation.

Failure to remove power from the backplane could cause module damage, degradation of performance, or injury.

2. Place the module in the plastic tracks on the top and bottom of the slot that guides the module into position.
3. Do not force the module into its backplane connector. Apply firm even pressure on the module to seat it properly.
4. Snap the chassis latch over the top of the module to secure it.

European Union Directive Compliance

If this product is installed within the European Union or EEA regions and has the CE mark, the following regulations apply.

EMC Directive

The Series B module is tested to meet Council Directive 89/336 Electromagnetic Compatibility (EMC) using a technical construction file and the following standards, in whole or in part:

- EN 50081-2 EMC – Generic Emission Standard, Part 2 – Industrial Environment
- EN 50082-2 EMC – Generic Immunity Standard, Part 2 – Industrial Environment

The product described in this manual is intended for use in an industrial environment.

Low Voltage Directive

The Series B module is also designed to meet Council Directive 73/23 Low Voltage, by applying the safety requirements of EN 61131–2 Programmable Controllers, Part 2 – Equipment Requirements and Tests.

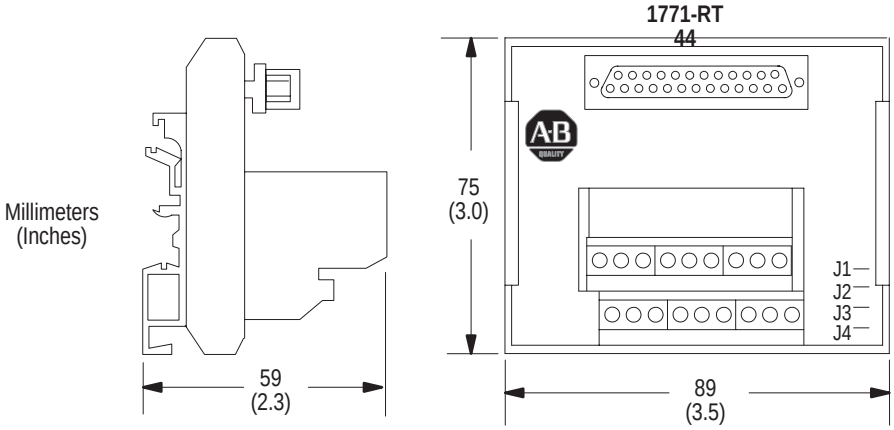
For specific information that the above norm requires, see the appropriate sections in this manual, as well as the following Allen-Bradley publications:

- Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1
- Guidelines for Handling Lithium Batteries, publication AG-5.4
- Automation Systems Catalog, publication B112

Installing the Remote Termination Panel (RTP)

For the Weigh Scale Module, you must use the 1771-RT44 remote termination panel. The remote termination panels are designed for mounting on standard DIN 1 or DIN 3 mounting rails. Mounting dimensions are shown in Figure 2.2.

Figure 2.2
Mounting Dimensions for the 1771-RT44 Remote Termination Panels

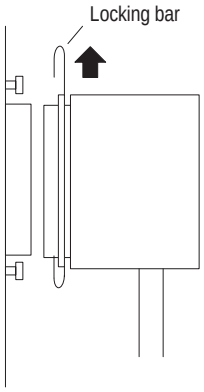


Connecting the Module to the Remote Termination Panel

Use the 1771-NC6 or -NC15 cable to connect the module to the RTP:

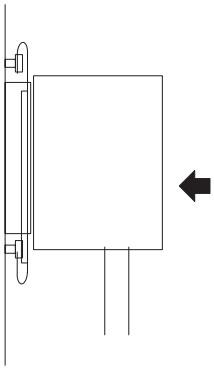
Step 1

Place locking bar in up position.



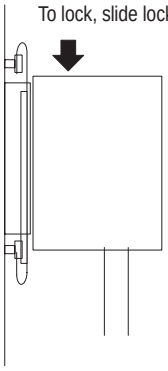
Step 2

Insert connector into mating connector on the processor front panel.



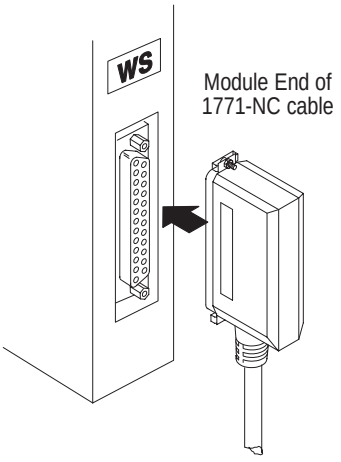
Step 3

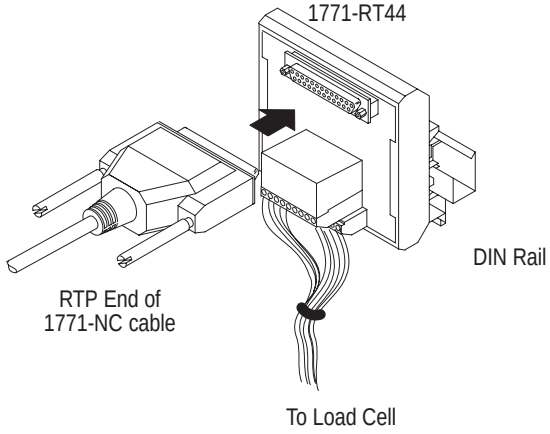
Slide the locking bar down over the mating pins on the module.



Step 4

Connect the other end of the cable to the remote termination panel. Use the thumbscrews on the panel to lock the connector in place..

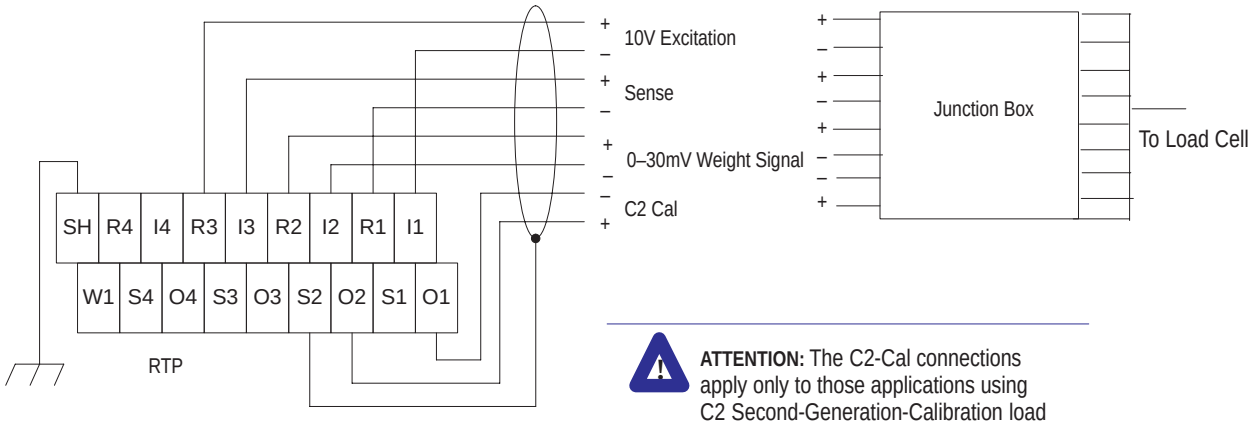




Connecting the Junction Box to the Remote Termination Panel

You must provide a cable from the junction box to the RTP. For this cable, if you are not using an external power supply and if the sense loop is needed, you must connect the conductors and the shield to terminals on the remote termination panel as shown in Figure 2.3.

Figure 2.3
Connecting Wires from the Junction Box to the Remote Termination Panel — Using the Module-generated Excitation and a Sense Loop

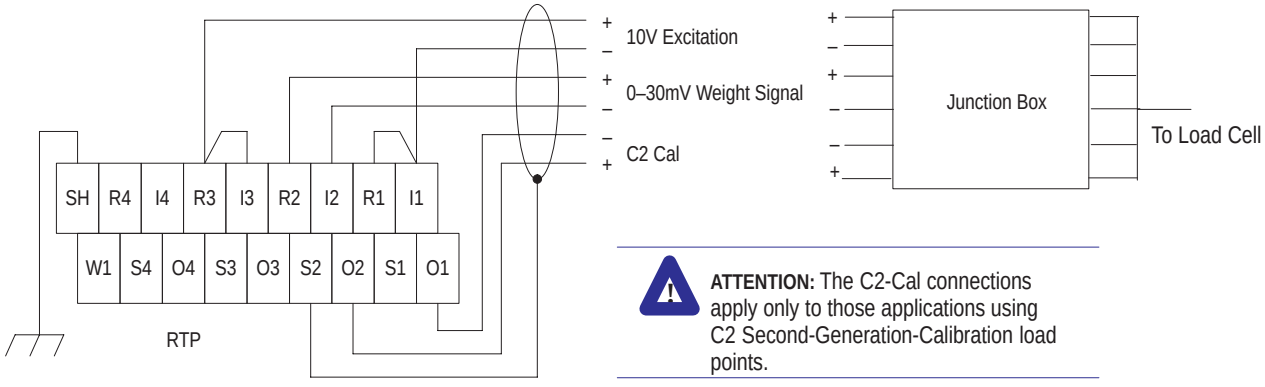


ATTENTION: The C2-Cal connections apply only to those applications using C2 Second-Generation-Calibration load points.

The load cell manufacturer may specify a cable length under which a sense loop is not needed. In that case, and if you are not using an external power supply, jumper the excitation signal to the sense signal at the termination panel as shown in Figure 2.4.

STOP When using C2 load cells, connect the sense lines between the junction box and the remote termination panel.

Figure 2.4
Connecting Wires from the Junction Box to the Remote Termination Panel — with the Module-generated Excitation Voltage Jumpered to the Sense Input

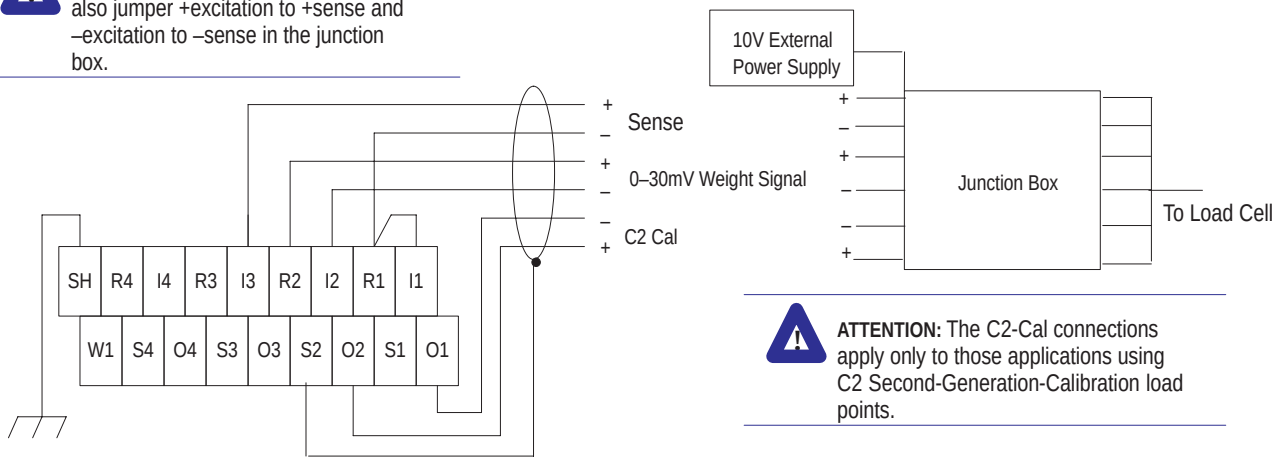


ATTENTION: The C2-Cal connections apply only to those applications using C2 Second-Generation-Calibration load points.

If you are using an external power supply for the excitation voltage, jumper the common of the excitation output (I1) to the common of the sense input (R1) at the remote termination panel as shown in Figure 2.5.

Figure 2.5
Connecting Wires from the Junction Box to the Remote Termination Panel — with the Excitation Voltage Generated by an External Power Supply

ATTENTION: In this configuration you must also jumper +excitation to +sense and –excitation to –sense in the junction box.



ATTENTION: The C2-Cal connections apply only to those applications using C2 Second-Generation-Calibration load points.

If the RTP is physically close to the the load cell, you can bypass the junction box and connect directly from the RTP to a load cell with no sense connection points. Connect the sense conductors from the RTP directly to the connection points where the excitation voltage is connected at the load cell. Use Table 2.A to determine connection points.

Table 2.A
Connection Points

RTP terminal designation	if you use the modules excitation voltage and a sense loop is needed, connect to	if you use the modules excitation voltage and a sense loop is not needed, connect to	if you use an external power supply for an excitation voltage, connect to
I1	– Excitation to junction box	– Excitation to junction box	1 on RTP
R1	– Sense from junction box	I1 on RTP	– Sense from junction box
S1	Shield	Shield	Shield
O1	– C2-Cal from junction box [1]	– C2-Cal from junction box [1]	– C2-Cal from junction box [1]
I2	– Signal from junction box	– Signal from junction box	– Signal from junction box
R2	+ Signal from junction box	+ Signal from junction box	+ Signal from junction box
S2	Shield	Shield	Shield
O2	+ C2-Cal from junction box [1]	+ C2-Cal from junction box [1]	+ C2-Cal from junction box [1]
I3	+ Sense from junction box	R3 on RTP	+ Sense from junction box

RTP terminal designation	if you use the modules excitation voltage and a sense loop is needed, connect to	if you use the modules excitation voltage and a sense loop is not needed, connect to	if you use an external power supply for an excitation voltage, connect to
R3	+ Excitation to junction box	+ Excitation to junction box	Not Used
S3	Shield	Shield	Shield
O3	Not Used	Not Used	Not Used
I4	Not Used	Not Used	Not Used
R4	Not Used	Not Used	Not Used
S4	Shield	Shield	Shield
O4	Not Used	Not Used	Not Used
SH	Ground	Ground	Ground
W1	Not Used	Not Used	Not Used

[1] These connections apply only to those applications using C2 Second-Generation-Calibration load points. A sense loop is required when using C2 Second-Generation-Calibration.

When selecting a cable to connect between the junction box and the remote termination panel, follow the load-cell manufacturer's specifications. Route this cable in a separate conduit and follow all guidelines for category-2 conductors as described in the PLC-5 user manual, publication 1785-6.5.12.

To connect the cable wiring from the junction-box at the remote termination panel:

1. Strip 9 mm (3/8 inch) of insulation from the wire.
2. Insert the wire into the open connector slot.
3. Tighten the screw to clamp the wire.

Important: The cable from the load cell to the remote termination panel can be connected through intrinsic-safety barriers of class I, II, III, div. 1 and 2, groups A through G. However, if you install the cable that is connected through any other type of intrinsic-safety barrier, the signals may be distorted such that the module will not meet the performance specifications.

Grounding the Shield

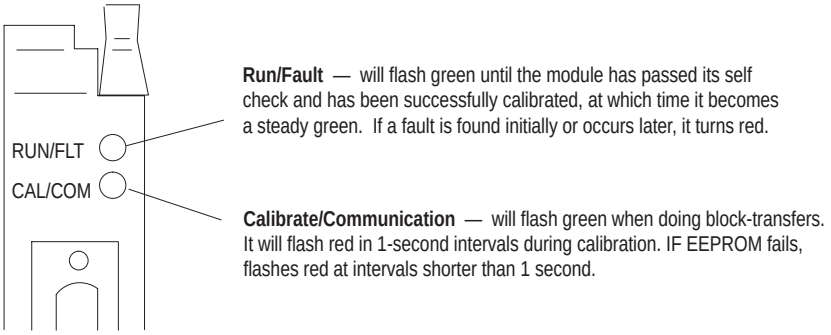
On the cable from the junction box to the RTP, connect the shield drain wire to the **S1, S2, S3, or S4** terminal on the RTP. All shield connections are internally connected together in the RTP so that only one wire is required to ground the entire remote termination panel.

In Figures 2.3, 2.4, and 2.5, we show a connection to **S2** for simplicity of illustration. Ground the shield at only one end of the cable. Because we don't know whether you have the ability to provide a good ground at the other end, we recommend that you ground the RTP by connecting a wire from the "**SH**" terminal on the RTP to a ground bus in the metal enclosure in which the remote termination panel is mounted.

Interpreting the Indicator Lights

The front panel of the 1771-WS module contains two bi-color indicators: a red/green RUN/FLT (fault) indicator and a red/green CAL/COM indicator. (See Figure 2.6.)

Figure 2.6
Diagnostic Indicators


RUN/FLT
CAL/COM
Run/Fault — will flash green until the module has passed its self check and has been successfully calibrated, at which time it becomes a steady green. If a fault is found initially or occurs later, it turns red.
Calibrate/Communication — will flash green when doing block-transfers. It will flash red in 1-second intervals during calibration. IF EEPROM fails, flashes red at intervals shorter than 1 second.

At power-up, the module runs through an initial self-diagnostic check. During this check, the RUN/FAULT indicator flashes green at a rate of 5 to 10 times a second. This self-diagnostic check lasts from 2 to 30 seconds, depending on the WAVERSAVER selection; the lower the frequency, the longer the time. When it completes this check satisfactorily, the RUN/FAULT indicator becomes a steady green. However, if the module does not have valid calibration data, the RUN/FAULT indicator will flash green at a rate of once a second.
If a fault is found initially or occurs later, the RUN/FLT indicator turns red.

The bottom indicator is the calibrate/communication indicator. This indicator flashes green when doing block-transfers; it flashes red during calibration.

What to do Next

To learn more about the laddder logic utility supplied with the WeighScale Module, read Chapter 3, “Using the Ladder Logic Utility.”

Notes:

Using the Ladder Logic Utility

What's in This Chapter?

This chapter tells you how to use the ladder logic utility and interface to your man-machine interface (MMI) supplied with WeighScale Configuration software.

What is the Ladder Logic Utility?

WeighScale Configuration software includes a ladder logic utility to minimize the programming you need to do to use the module. The utility provides:

- all the ladder logic code required for using the configuration software with your module
- logic and data table files to use another MMI with WeighScale Configuration software

The ladder logic utility includes software that you can use with your own MMI, such as RSView™, PanelView™, or any MMI that can read and write to a PLC-5 processor data table. This software we provide functions as an "interface" to the MMI package you are using. This "MMI interface" lets you program logic to enter values and set and clear bits to do certain functions.

The software we provide allows your MMI software and WeighScale Configuration software to work independently of one another. So you can use WeighScale Configuration software to configure the module, and your own MMI to calibrate the module or monitor your process.

Series B only

Important: This utility can be used only with Series B or later modules in double density mode on enhanced PLC-5 processors. If you are using a Series A module, a Series B module in single density mode, or a Classic PLC–5, you must write your own ladder logic. See Appendices A and B of this manual.

Important: Do not use your MMI and WeighScale Configuration software to perform functions that access the same part of the data table. Unpredictable system operation may result. For example, if you are using the WeighScale calibration wizard to perform a calibration, do not try to calibrate the module at the same time with your own MMI.

Using the Ladder Logic Utility

To use the ladder logic utility:

1. Select an unused program file to be used for the utility.
2. Determine the rack and group values for the module.
3. Allocate an integer data table block for the module.

   Each module requires 160 contiguous integer elements.
4. Allocate a floating-point data table block for the module.

   Each module requires 30 contiguous floating-point elements.
5. Copy the ladder logic utility to your development computer.

to use this ladder logic programming format	copy these files
6200	\IPDS\ARCH\PLC5\WEIGH.*
AI	\PLC5\PROGS\AI\WEIGH.*

Avoiding losing comments and symbols

To avoid losing your comments and symbols when editing your ladder logic, do the following:

A. Export the ladder logic and documentation to ASCII file(s).

B. Use a text editor to edit the files.

C. Import the files into your programming software.

You can import both 6200 and AI format files into RSLogix5.

Changing ladder logic utility defaults

The ladder logic utility uses program file 2 as a default, and assumes that the module is located in rack 0, group 1, module 0. The utility also assumes that the integer block is N9:0 to N9:159, and the floating point block is F10:0 to F10:29. If your module differs from the default, you need to modify the ladder logic utility code. We tell you how in steps 6 and 7, below.

6. Use your programming software to change the following to reflect your choices:
   - default program file number
   - rack, group, and module values in the BTR and BTW instructions
   - input bit addresses (rungs 4 and 5) for the rack and group
   - all references to N9:XXX and F10:XXX
7. Adjust all element numbers if your integer or floating point blocks do not begin with element 0.
8. Download the program to the PLC processor.

Using the Interface to the MMI

To use the interface we provide to the MMI, you must write logic to enter values and set and clear bits (described in the table below). See table 3.C for symbolic identifiers.

to perform this function	your logic should
tare	set MMI_TARE (N9:1/1) the module performs the tare until the bit is cleared
zero	set MMI_ZERO (N9:1/2) the module perform the zero until the bit is cleared
change setpoints, deadbands, or preacts	**1.** Enter new values in floating point words 2 through 7. Current values are in words 8 through 13. **2.** Set MMI_SETPOINTS (N9:1/0). **3.** Clear MMI_SETPOINTS (N9:1/0).
hard calibration	**1.** Configure the module by using WeighScale Configuration software, or manually setting configuration parameters. **2.** Toggle MMI_HARD_CAL (N9:1/3) on, then off. **3.** When MOD_STS_CAL_MODE (N9:71/1) is set, place the low weight on the scale and enter the value in F10:20. **4.** Toggle MMI_ACCEPT_LOW (N9:1/6) on, then off. **Important:** Step 5, below, is optional and can be skipped. **5.** When MOD_STS_LOW_GOOD (N9:72/8) is set, place the midpoint linearization weight on the scale and enter the value in F10:21. **6.** Toggle MMI_ACCEPT_MID (N9:1/7) on, then off. **7.** When MOD_STS_MID_GOOD (N9:72/9) is set, place the high weight on the scale and enter the value in F10:22. **8.** Toggle MMI_ACCEPT_HIGH (N9:1/8) on, then off. **9.** When MOD_STS_HIGH_GOOD N9:72/10) is set, toggle MMI_ACCEPT_CAL (N9:1/9) on, then off. To cancel the calibration, set MMI_CANCEL_CAL (N9:1/10).
soft calibration	**1.** Configure the module by using WeighScale Configuration software, or manually setting configuration parameters. **2.** Enter the sensitivity value in F10:23. **3.** Toggle MMI_SOFT_CAL (N9:1/4) on, then off. **4.** When MOD_STS_CAL_MODE (N9:71/1) is set, place the low weight on the scale and enter the value in F10:20. **5.** Toggle MMI_ACCEPT_LOW (N9:1/6) on, then off. **6.** When MOD_STS_LOW_GOOD (N9:72/8) is set, toggle MMI_ACCEPT_CAL (N9:1/9) on, then off.
C2 calibration	**1.** Configure the module by using WeighScale Configuration software, or manually setting configuration parameters. **2.** Toggle MMI_C2_CAL (N9:1/5) on, then off. **3.** When MOD_STS_C2_READ_GOOD (N9:71/12) is set, place the low weight on the scale and enter the value in F10:20. **4.** Toggle MMI_ACCEPT_LOW (N9:1/6) on, then off. **5.** When MOD_STS_LOW_GOOD (N9:72/8) is set, toggle MMI_ACCEPT_CAL (N9:1/9) on, then off.

to perform this function	your logic should
restore calibration	**1.** Configure the module by using WeighScale Configuration software, or manually setting configuration parameters. **2.** Copy the voltage values from the BTR to the BTW block (ladder and configuration software do this automatically on completion of a successful calibration). **3.** Toggle MMI_RESTORE_CAL (N9:1/11) on, then off.

Understanding the Data Table Layout

The following tables show the location of the integer and floating point blocks the ladder logic utility uses.

Important: Avoid using any locations marked “reserved.”

Table 3.A Integer file layout

address	description
N9:0	internal control bits
N9:1	MMI interface bits
N9:2–3	internal control bits
N9:4–8	reserved
N9:9/1 and /2	copy of single transferred preact bits
N9:10–58	configuration/calibration block
N9:59–69	reserved
N9:70–133	status block
N9:134–139	reserved
N9:140–145	BTW control block
N9:150–155	BTR control block
N9:156–159	reserved

Table 3.B Floating point file layout

address	description
F10:1	net weight for display
F10:2	new setpoint 1
F10:3	new setpoint 2
F10:4	new deadband 1
F10:5	new deadband 2
F10:6	new preact 1
F10:7	new preact 2
F10:8	current setpoint 1
F10:9	current setpoint 2
F10:10	current deadband 1
F10:11	current deadband 2
F10:12	current preact 1
F10:13	current preact 2
F10:14–19	reserved
F10:20	low weight for calibration
F10:21	midpoint weight for calibration
F10:22	high weight for calibration
F10:23	sensitivity for soft calibration
F10:24–27	reserved
F10:28	reserved
F10:29	reserved

Understanding Symbolic Names Used by the Utility

The ladder logic utility uses symbolic names to identify certain events that occur when a bit is set. We list the symbolic names here.

symbolic names that begin with	are
an underscore	local variables and control bits
MMI_	MMI interface bits
MOD_CMD_	command bits to the module
MOD_STS_	status bits from the module

Table 3.C Symbolic names

address	symbolic name
I:001/10	PREACT1INPUTSTATUS
I:001/11	PREACT2INPUTSTATUS
N9:0/0	_CS_BTW_COMMAND
N9:0/1	_CAL_BTW_COMMAND
N9:0/2	_MMI_BTW_COMMAND
N9:1/0	MMI_SETPOINTS
N9:1/1	MMI_TARE
N9:1/2	MMI_ZERO
N9:1/3	MMI_HARD_CAL
N9:1/4	MMI_SOFT_CAL
N9:1/5	MMI_C2_CAL

address	symbolic name
N9:1/6	MMI_ACCEPT_LOW
N9:1/7	MMI_ACCEPT_MID
N9:1/8	MMI_ACCEPT_HIGH
N9:1/9	MMI_ACCEPT_CAL
N9:1/10	MMI_CANCEL_CAL
N9:1/11	MMI_RESTORE_CAL
N9:2/0	_SETPOINTS_LATCH
N9:2/1	_SETPOINTS_CHANGED
N9:2/2	_TARE_OK
N9:2/3	_ZERO_OK
N9:2/4	_HARD_CAL
N9:2/5	_SOFT_CAL
N9:2/6	_C2_CAL
N9:2/10	_EXIT_CAL
N9:2/11	_MMI_ZERO_LATCH
N9:2/12	_MMI_TARE_LATCH
N9:2/13	_CS_BTW_CMD_LATCH
N9:2/14	_CAL_GOOD
N9:2/15	_RESTORE_CAL
N9:9/1	MOD_STS_PREACT_1
N9:9/2	MOD_STS_PREACT_2
N9:12/0	MOD_CMD_TARE
N9:12/1	MOD_CMD_ZERO
N9:42/0	MOD_CMD_CAL_MODE
N9:42/1	MOD_CMD_RESTORE_CAL
N9:42/2	MOD_CMD_HARD_SOFT
N9:42/3	MOD_CMD_SOFT_C2
N9:42/4	MOD_CMD_READ_LOW
N9:42/5	MOD_CMD_READ_MID
N9:42/6	MOD_CMD_READ_HIGH
N9:42/7	MOD_CMD_ACCEPT_CAL
N9:42/8	MOD_CMD_READ_C2
N9:70/7	MOD_STS_TARE_GOOD
N9:70/8	MOD_STS_ZERO_GOOD
N9:71/1	MOD_STS_CAL_MODE
N9:71/4	MOD_STS_WRITE_GOOD
N9:71/12	MOD_STS_C2_READ_GOOD
N9:71/14	MOD_STS_RESTORE_GOOD
N9:72/8	MOD_STS_LOW_GOOD
N9:72/9	MOD_STS_MID_GOOD
N9:72/10	MOD_STS_HIGH_GOOD
N9:140/13	_BTW_DONE
N9:140/15	_BTW_ENABLE
N9:150/13	_BTR_DONE
N9:150/15	_BTR_ENABLE

What to do Next

To help learn how to install and use WeighScale Configuration software, read Chapter 4, “Getting Started With WeighScale Configuration Software.”

Getting Started With WeighScale Configuration Software

This chapter shows you how to install WeighScale Configuration software for the 1771-WS module.

Introducing WeighScale Configuration Software

WeighScale configuration software version 2.0 lets you configure, calibrate, and monitor your WeighScale modules (1771-WS, Series B and higher). Version 2.0 is compatible with versions 1.0 and 1.1. However:

You ***cannot*** open a project file that was created in a newer version of the WeighScale software in an older version of the software.

For example, if you are using v1.1 of WeighScale software, you ***cannot*** open project files that you created with newer versions of the software.

The software provides:

- simple screens for viewing and modifying configuration parameters
- an operator screen for monitoring module operation and changing operating parameters (such as setpoints)
- a ladder logic utility to minimize programming
- installation over a network
- tips for using the software on all input fields (not available in Windows 3.1)
- a Wizard to guide you through the calibration process

Windows Compatibility

WeighScale Configuration software is compatible with Microsoft® Windows 3.1 and 3.11, Windows 95 and Windows NT™3.51 and 4.0. See page 4–4 for more on system requirements.

Communication Software Compatibility

WeighScale configuration software version 2.0 is compatible with INTERCHANGE or RSLinx communication software (see the table below). INTERCHANGE software ***is no longer supplied with the software***. Contact your Rockwell Automation representative for assistance in obtaining communication software.

on this operating system	WeighScale software is compatible with INTERCHANGE (version 6.1.0 or later)	WeighScale software is compatible with RSLinx, RSLinx C Development, or RSLinx OEM[1]
Windows 3.1 or 3.11	Yes	No
Windows 95	Yes	Yes (version 1.7 or later)
Windows NT 3.51 or 4.0	No	Yes

[1] WeighScale software is not compatible with RSLinx Lite.

For Information about INTERCHANGE software

You can refer to the INTERCHANGE Software for Windows Release Notes, publication 5850-6.5.2-RN1 and publication 5850-6.5.2-RN2, and the INTERCHANGE Software for Windows User Manual, publication 5850-6.5.2, if you have specific questions about INTERCHANGE software.

For Information about RSLinx software

You can refer to the RSLinx OEM User's Guide, publication Doc ID 9399-WABOUG, if you have specific questions about RSLinx software.

Important: When using RSLinx, you must perform the client application configuration. To do this:

1. Start RSLinx.
2. Select **Communications...Configure Client Applications**.
3. Select the INTERCHANGE port mapping tab.
4. Choose an INTERCHANGE port (typically (1KT:0).
5. Select the RSLinx driver to use (for example, AB_kt–1).
6. Click on Ok.

Obtaining Weigh Scale Software

WeighScale configuration software ***is no longer supplied with the module***. You can obtain the software by:

- downloading it from the Internet at http://www.ab.com
- ordering diskettes by mailing the response card included with your module, or
- ordering diskettes by calling the toll-free number printed on the response card

Downloading Software from the Internet

To obtain WeighScale software over the World Wide Web, your computer must have access to the Internet with web browser software, such as Netscape Navigator or Microsoft Internet Explorer. Follow these steps to download the software from the Internet:

1. Connect to the Internet and launch your web browser.
2. Type the url (or address) of the Rockwell Automation web site. The url is http://www.ab.com. Click **Enter.**
3. When the Rockwell Automation home page displays, click on "Search our Site".
4. Type `Weigh Scale Module Configuration Software` in the Search field. Click **Search.**
5. Click on the link to WeighScale configuration software. The WeighScale configuration software page displays.
6. Download the required files. Refer to the following table:

to	download
get a description of features	the Help file only
download the software to the same computer you will run it on	the WeighScale configuration software file for Windows 3.1, 3.11, 95 or NT systems **Important:** Do not copy this file to a diskette. The file is too large for a single diskette.
download the software to the computer you will access over a network	the WeighScale configuration software file for Windows 3.1, 3.11, 95 or NT systems **Important:** Do not copy this file to a diskette. The file is too large for a single diskette.
install the software from diskettes	diskette image files

Important: For Windows 3.1 or 3.11 installations, you will need the Win32s utility (included with 3.1 and 3.11 files).

Ordering Software by Mail or Telephone

The WeighScale module ships with a reply card you can use to order configuration software on diskettes. You do not need to specify the operating system when you order diskettes. The diskettes can be used with any of the supported operating systems.

To order diskettes, complete the card and mail it to the address show, or call the toll-free number shown on the card.

Communicating with PLC-5 and ControlNet Processors over the DH+ and Ethernet Networks

When using WeighScale Configuration software, remember:

- WeighScale Configuration software is compatible with 1785 PLC-5 processors

  It is not compatible with PLC-5/250™ processors.
- Weigh Scale Configuration software is compatible with ControlNet processors over a DH+ or serial network
- WeighScale Configuration software communicates with PLC-5 processors over a DH+ network using a 1784-KT/B, 1784-KL, 1784-KTX, 1784-KTXD, or 1784-PCMK communication adapter

  If you are using DF1 protocol, you can also communicate with the processor through a serial port.
- You can use RSLinx™ for Ethernet® communication with the PLC-5 processor

  WeighScale Configuration software communicates through a DH+ port on an Ethernet PLC-5 processor.

System Requirements

To use WeighScale Configuration software, your system must meet these requirements:

Hardware

- computer with an 80486 or greater microprocessor
- at least 16 Mbytes of RAM
- Hard drive with adequate free disk space (15 Mbytes or greater)
- 1.44 Mbyte floppy disk drive ***or*** Internet connection (for installing the software)
- VGA™ or higher-resolution adapter/monitor with small fonts (640x480, 800x600, 1024x786 modes supported)

  We recommend a Super VGA resolution adapter/monitor.
- mouse
- DH+ port (on KT- or KL-type module), serial port
- Ethernet port (with RSLinx only)

Software

- Microsoft Windows 95, or NT 3.51 or 4.0
- Microsoft Windows v3.1 running in 386 enhanced mode (a permanent swap file of at least 20 Mbytes in size is recommended)

  You can also use Microsoft Windows for Workgroups v3.11.
- WeighScale Configuration software

Installing the Software

Install WeighScale software to configure the Weigh Scale Module. To install WeighScale Configuration software, do one of the following:

- install the program from the 5 installation diskettes you received by mail by executing setup.exe on disk 1, or
- Double-click on the executable file (filename.exe) you downloaded to extract the installation program. Then run setup.exe.

  The wizard guides you through the installation process.

Starting the Software

After you've rebooted your computer, follow these steps to start the software:

STOP

Do not start a second copy of WeighScale Configuration software while one copy is already running on the same computer. The software cannot prevent you from doing this. However, if you do, communication conflicts or memory shortages can cause errors or other problems.

Windows 3.1, 3.11, or NT 3.5.1

From the Allen-Bradley program group, double-click on

Windows 95 or NT 4.0

From the Start menu, select ➡ Programs ➡ Allen-Bradley ➡ WeighScale Configuration Software

When the software is loaded, you see the Weigh Scale Module Project screen:

To close WeighScale software, from the **File** menu, choose **Exit**.

Creating projects

For more information on creating projects, see Chapter 6.

Configuring and calibrating the module

Read Chapter 8 and Chapter 9 to learn how to use WeighScale software to configure and calibrate your module.

Using the software with earlier versions of project files

If you created project files using earlier versions of WeighScale software, you can open them with this version of the software. For example, if you are using v2.0 of WeighScale software, you can open project files that you created using v1.0 or 1.1 of the software. After you have opened the file, you can save the file in the same file format as that of the software version that you are using.

Once you have opened an older version of a project file and saved it to the current version, you can no longer open it in the older version of the software.

You ***cannot*** open a project file that was created in a newer version of the WeighScale software in an older version of the software.

For example, if you are using v1.1 of WeighScale software, you ***cannot*** open project files that you created with newer versions of the software.

Using Online Help

To access the WeighScale software online help, from the **Help** pull-down menu, select **Contents**.

if you are using	you see	so you should
Windows 3.1, 3.11, or NT 3.5.1	the help contents screen	double-click on a topic to view it
Windows 95 or NT 4.0	book icons	double-click on a book to open the topic

To view help for a particular screen, click on a field for which you want help.

What to do Next

To help learn how to configure the security system, read Chapter 5, “Supervising the Security System.”

Notes:

Supervising the Security System

This chapter shows you how to supervise the security system for accessing WeighScale Configuration software.

Controlling Security

WeighScale Configuration software provides ***optional*** security access. You do not have to use security to access the system. If you are the person who possesses the software disks, you ultimately have control of security because you can always re-install the software. However, the security system is set up for a user with the username of **"supervisor"** to control security.

The supervisor can set up usernames with passwords and privileges or change them at any time. The supervisor can even set up another username with the privilege to set up usernames with passwords and privileges.

ATTENTION: If the supervisor gives someone else edit-users privileges, that person then has the privilege to edit the supervisor's password.

When the software is first installed, there are no security restrictions; no usernames or passwords are needed. Anyone can access any screen to do any task. The security privilege selections take effect only after you enable security, shut down (return to Windows), and then reenter WeighScale software.

Once security is enabled, you need a username, password, and the appropriate privilege to use the software. Also, once security is enabled, only the supervisor or someone who has the privilege can disable security.

We list privilege categories in the following table:

if you select this category	and this privilege	users can
Calibrate	View	view the calibration selections
	Calibrate	calibrate the module
	Read On–board Resistance	read module resistance for testing
	Restore Calibration	restore a previously saved calibration
Monitor	View	view monitor selections
	Perform Tare or Zero	tare or zero the scale
	Update Setpoints	update setpoints
Scale Configurer	View	view the configuration selections
	Update	update the configuration selections
Module List	View	view the module list
	Update	update the module list
Security System	Edit Users	• add users • delete users • add privileges for users • remove privileges for users • change passwords
	Disable Security	disable the security system

Accessing the Security System

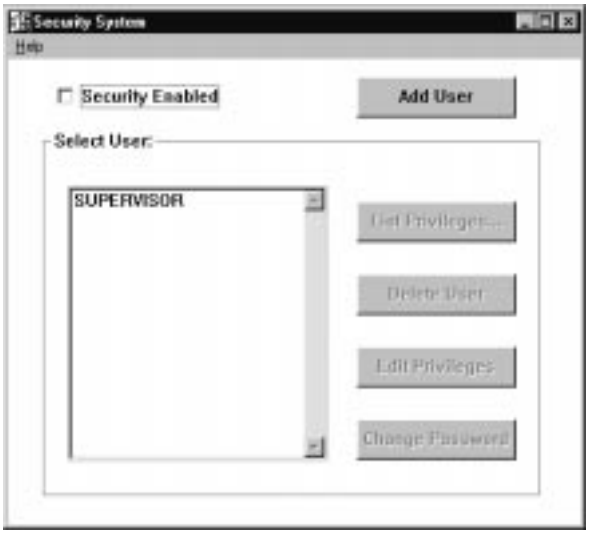
To access the security system:

1. If it is not already started, start the software.

   You see the Weigh Scale Module Project screen:

2. On the Weigh Scale Module Project screen, from the **Access** pull-down menu, select **Configure Security System**.

   You see the Security System screen.



Initially, only the username “supervisor” is listed. As you add users, their usernames are also listed. From this screen, you can:

- add users
- list privileges
- delete users
- edit privileges
- change passwords

Adding a User

To add a user to the security system:

1. At the Security System screen, click on Add User .

STOP If security is enabled and you try to add a user, and if you are not the supervisor or do not have the “Edit Users” privilege, you cannot access the Add User screen.

You see the Add User screen:

2. On the Add User screen, enter the username and password.
3. Re-enter the password to verify it.
4. Select the privilege categories as appropriate for the particular user.
5. Select the privileges under each category as appropriate for the particular user.

Selecting privileges

Clicking on Select All selects all listed privileges; clicking on Select None deselects previous selections.

6. Click on OK.

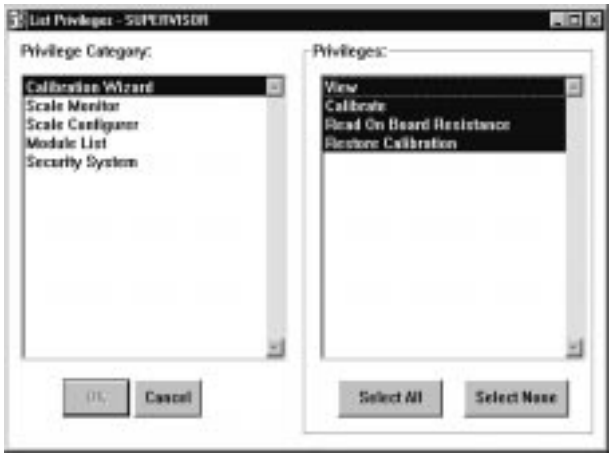
Listing Privileges

To list privileges assigned for a user:

1. At the Security System screen, cursor to the username.
2. Click on List Privileges....

STOP If security is enabled and you try to view someone else's privileges, and if you are not the supervisor or do not have the "Edit Users" privilege, you cannot access the List Privileges screen.

You see the List Privileges screen:



From this screen, you can view your own privileges. For example, the user "Calibration Wizard" can view calibration data, calibrate a module, read on-board resistance, and restore calibration data.

3. When you are done viewing the privileges, click on OK.

Deleting a User

To delete a user from the security system:

1. At the Security System screen, cursor to the username.
2. Click on Delete User.

   You see:

3. Click on Yes.

STOP If security is enabled and you try to delete a user, and if you are not the supervisor or do not have the “Edit Users” privilege, you cannot delete a user.

Editing Privileges

To edit privileges assigned for a user:

1. At the Security System screen, cursor to the username.
2. Click on Edit Privileges.

STOP If security is enabled and you try to edit privileges, and if you are not the supervisor or have the “Edit Users” privilege, you cannot access the Edit Privileges screen.

You see the Edit Privileges screen:

3. Select the privilege categories as appropriate for the particular user.
4. Select the privileges under each category as appropriate for the particular user.

Selecting privileges

Clicking on Select All selects all listed privileges; clicking on Select None deselects previous selections.

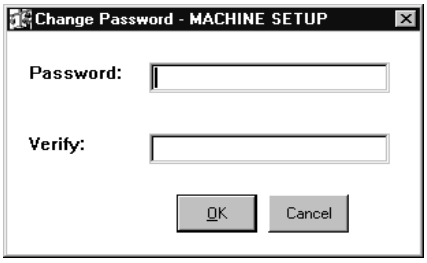
5. Click on OK.

Changing a Password

To change the password assigned for a user:

1. At the Security System screen, cursor to the username.
2. Click on Change Password.

   You see the Change Password dialog box:



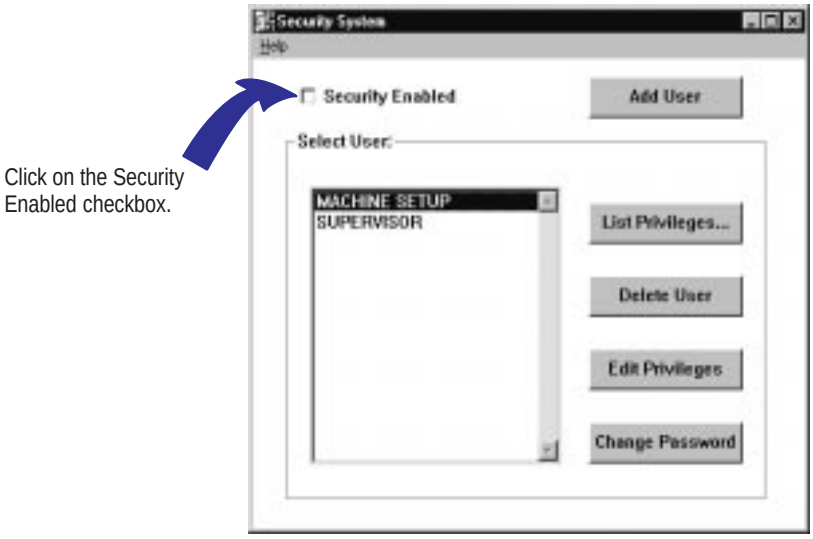
3. Enter the new password.
4. Re-enter the password to verify it.
5. Click on OK.

STOP You can change your own password. However, if security is enabled and you try to change a password, and if you are not the supervisor or do not have the "Edit Users" privilege, you cannot change the password.

Enabling Security

To enable security:

1. At the Security System screen, select the **Security Enabled/Disabled** checkbox. (This is a toggle selection.)



2. The Information prompt tells you that you must shut down and re-start the application for security to be enabled. Click on OK.

STOP

The security privilege selections take effect only after you:

- enable security
- exit WeighScale software and return to Windows
- restart WeighScale software

After security is enabled:

- a username, password, and the appropriate privileges are needed to use the software
- only the supervisor or someone delegated the privilege can disable security

Logging in

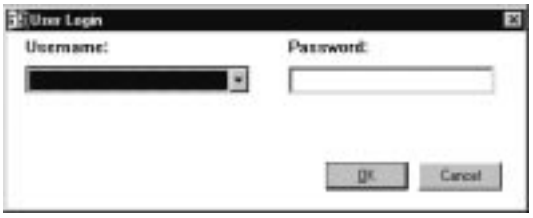
Once security is enabled, you access WeighScale software functions by logging into the software.

1. If it is not already started, start the software.

   You see the Weigh Scale Module Project screen:

2. On the Weigh Scale Module Project screen, from the **Access** pull-down menu, select **Login**.

   You see the User Login dialog box:



3. Enter your username and password.
4. Click on OK.

Logging out

To log out of the WeighScale software:

1. Bring up the Weigh Scale Module Project screen.
2. From the **Access** pull-down menu, select **Logout**.
3. When the software prompts you if you are sure you want to log out, click on Yes.

What to do Next

To help learn how to create projects, read Chapter 6, “Managing Projects.”

Managing Projects

Before you can begin using Weigh Scale Configuration software to configure and operate your modules, you must set up a project file and add your module(s) to the project. This chapter shows you how to set up the project file.

What is a Project File?

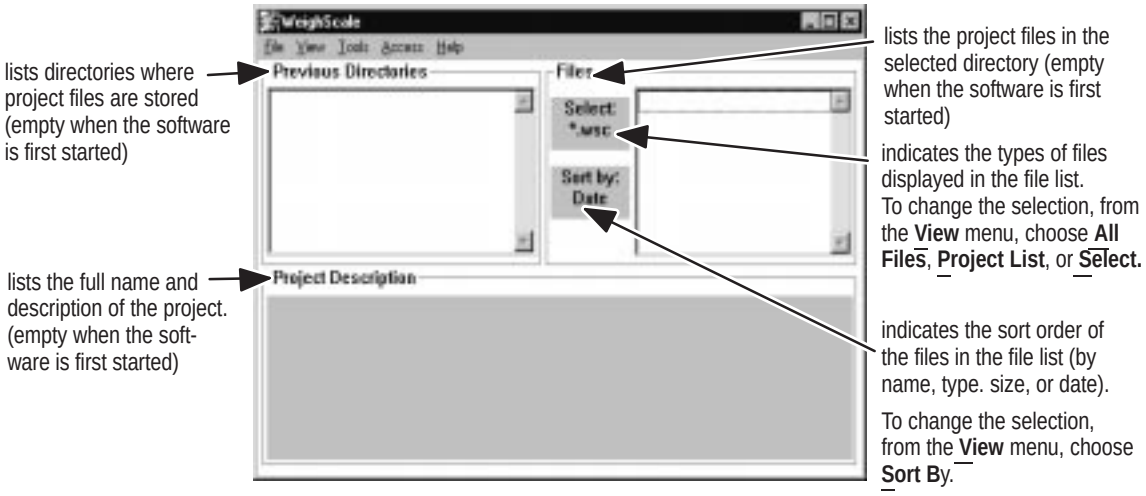
You can use a project file to organize or group modules (for example, all modules on a manufacturing line could be grouped in a project file). The project file stores configuration information about the module(s) you added to the project. The file can include any number of modules. WeighScale Configuration software supports an unlimited number of project files.

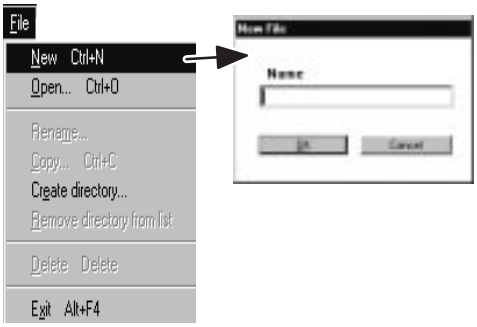
▶ Project files have a .wsc extension.

Creating a New Project File

Follow these steps to create a new project file.

1. Start WeighScale Configuration Software. You see the Project Manager screen.

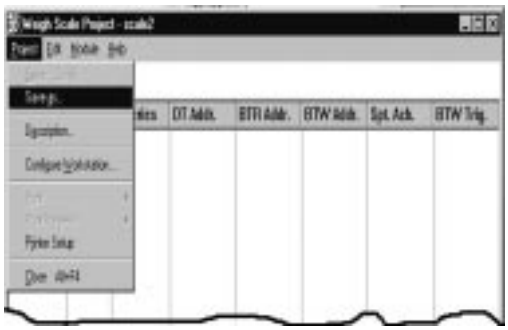

lists directories where project files are stored (empty when the software is first started)
lists the full name and description of the project. (empty when the software is first started)
Previous Directories
Files
Select: *.wsc
Sort by: Date
Project Description
lists the project files in the selected directory (empty when the software is first started)
indicates the types of files displayed in the file list. To change the selection, from the View menu, choose All Files, Project List, or Select.
indicates the sort order of the files in the file list (by name, type. size, or date).
To change the selection, from the View menu, choose Sort By.



2. From the Project Manager screen, select **File...New**. The New File dialog box appears.
3. Type a name for the new project.

   The filename *cannot* contain spaces. You can use an underscore (_), however.

4. Click on OK. The Module List screen opens.



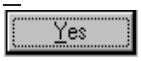
5. On the Module List screen, select **Project...Save as**.
6. Type the name you want to save the file as.

   This saves the file to your computer's hard drive.

Using the Module List screen

We tell you how to use the Module List screen in chapter 7.

Deleting the project file

To delete a project file, highlight the project file name in the project list. Press the Delete key on your keyboard, or from the **File** menu, select **Delete**. Confirm the delete by clicking on 

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Opening an Existing File

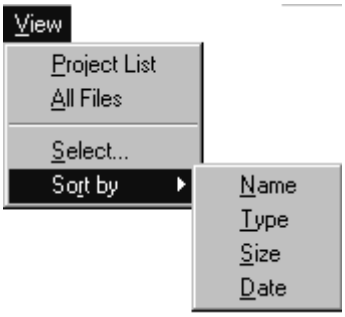
To open an existing file:

if	then
the directory containing the existing project is shown in the Previous Directories field	**1.** Click on the directory to select it. **2.** Double-click on the project file. or **1.** Select the directory by highlighting it. **2.** From the **Tools** menu, select **Go to Selection**
the directory containing the existing project is not shown on the Previous Directories field	**1.** From the **File** menu, select **Open**. **2.** In the File Open dialog, select the desired directory and file.
you are not sure which project to open	Single-click on the project file name in the Files field. You see the full filename and description.

Specifying Files to Be Displayed

To specify the files to be displayed in the File field:

to	do this
display only files with a .wsc extension	From the **View** menu, select **Project List**
display all files in the selected directory	From the **View** menu, select **All Files**
display files based on a filter you specify	**1.** From the View menu, select **Select.** **2.** Type a selection filter in the dialog box. You can use the * wildcard to specify any characters and the ? wildcard to specify a single character. **3.** Click on OK.

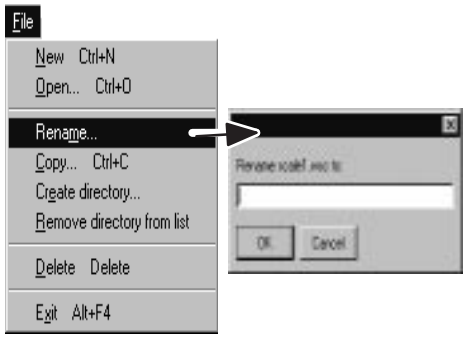


Specifying How Files are Sorted

You can sort files by name, type, size, or date. To specify how files are sorted:

1. Select **View...Sort by**.
2. Select Name, Type, Size, or Date.

Renaming an Existing File



To rename an existing file:

1. Select the file to be renamed.
2. Select **File...Rename**.
3. In the dialog box that appears, type the new filename.
4. Click on OK.

Copying an Existing Project

To copy an existing project:

1. Select the file to be copied.
2. Select **File...Copy**.
3. In the dialog box that appears, select the directory to which you want to copy the file.
4. Type a filename for the copy of the project.
5. Click on Save.

Creating a New Directory

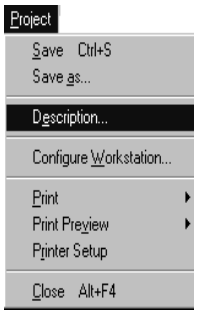
To create a new directory, either use Windows Explorer or File Manager, or follow these steps:

1. Select **File...Create Directory**.
2. In the dialog box that appears, enter the directory pathname.
3. Click on OK. The new directory is automatically added to the Previous Directories list.

Removing a directory from the Previous Directories list

To remove a directory from the the Previous Directories list, highlight the directory. From the **File** menu, select **Remove Directory from List.**

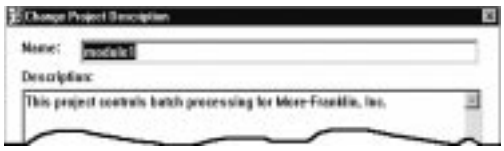
Entering or Modifying the Project Description



You can enter descriptive information for a project to be used when you print reports. To modify the project description:

1. On the Module List screen, select the project you want to modify by using your cursor to highlight it.
2. Select **Project...Description**.

You see the Change Project Description dialog with the current settings displayed.



3. Make the desired changes.
4. Click on OK.

What to do Next

To help learn how to manage modules in your project, read Chapter 7, “Managing Modules.”

Notes:

Managing Modules

Before you can use WeighScale Configuration software to configure or control a module, you must add the module to a project with the Module List screen. When you create a new project or open an existing one, the Module List screen displays. On this screen you can enter descriptive information, such as:

- module name
- PLC processor Data Highway node address
- module Series
- data table address
- block transfer read address
- block transfer write address
- setpoint achieved address
- block transfer write trigger address

Before you can communicate with the modules you add, you must configure your development computer (workstation). We tell you how in this chapter. Also, we show you how to use the Module List screen to manage the modules in your project.

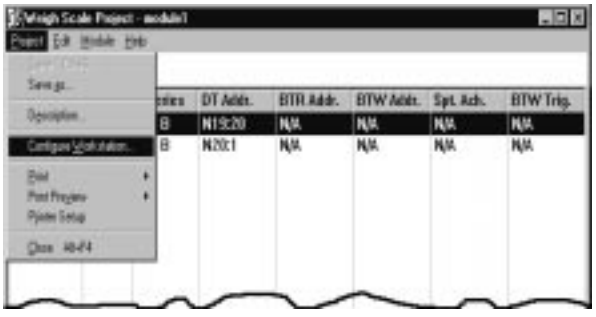
Accessing commands on the Module menu

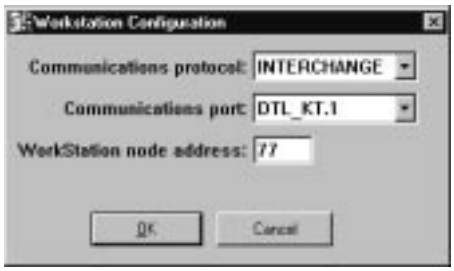
You can access all of the commands on the Module menu by placing the mouse pointer on the Module List screen and right-clicking.

Configuring a Workstation

Follow these steps to configure your development computer to communicate with modules in your project.

1. On the Module List screen, select **Project...Configure Workstation**.





2. On the Configure Workstation dialog that appears, select the communications protocol. Choose from INTERCHANGE or RSLinx.

Important: If you are using RSLinx, you must perform the client application configuration. We tell you how in Chapter 3 of this manual.

3. Select the communications port.
4. Set the workstation node address (the DH+ node address of your computer).
5. Click on OK.

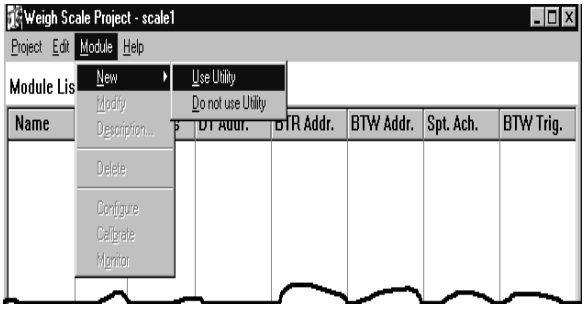
Adding a Module to a Project

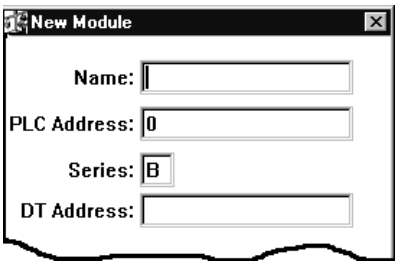
Follow these steps to add modules to your project.

Adding a Module When You Are Using the Ladder Logic Utility

You can use the ladder logic utility supplied with WeighScale Configuration software to perform block transfers to and from the module. To add a new module that will use the ladder logic utility, follow these steps:

1. On the Module List screen, select **Module...New...Use Utility**.





2. In the New Module dialog that appears, type this information:

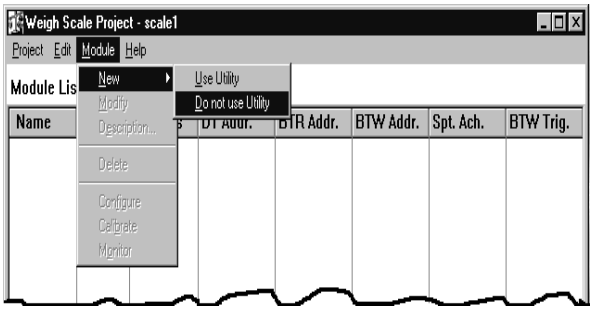
in this field	type
Name	the name of the module (cannot use spaces, but can include underscores)
PLC address	the PLC processor Data Highway node address (does not apply to serial connection, but you must still specify a node address of 1)
Series	the module Series (ladder logic utility supported by Series B or later)
DT Address	the address of the first word of the data table block allocated to this module

3. Click on OK. The module is added to the list.

Adding a Module When You Are Not Using the Ladder Logic Utility

If you are using a method other than the ladder logic utility to perform block transfers to and from the module, follow these steps:

1. On the Module List screen, select **Module...New...Do Not Use Utility**.



2. In the New Module dialog that appears, type this information:

in this field	type
Name	the name of the module (cannot use spaces, but can include underscores)
PLC Address	the PLC processor Data Highway node address (does not apply to serial connection, but you must still specify a node address of 1)
Series	the module Series
BTR Data Address	the starting address for the PLC processor block transfer read data
BTW Data Address	the starting address for the the PLC processor block transfer write data
Setpoint Achieved Address	the address of the data table word where your ladder logic copies the setpoint status bits from the input image file
BTW Trigger Bit Address	the address of the PLC processor data table bit that triggers a block transfer write

3. Click on OK. The module is added to the list.

Moving a Module From One Project to Another

To move a module from one project to another:

1. On the Module List screen, select the module you want to move by highlighting it.
2. Select **Edit...Cut**.
3. Open the destination project.
4. Select **Edit...Paste Into New...Use Utility** or **Edit...Paste Into New...Do Not Use Utility**.
5. Complete the New Module dialog box as described previously.
6. Click on OK. The module is added to the list.

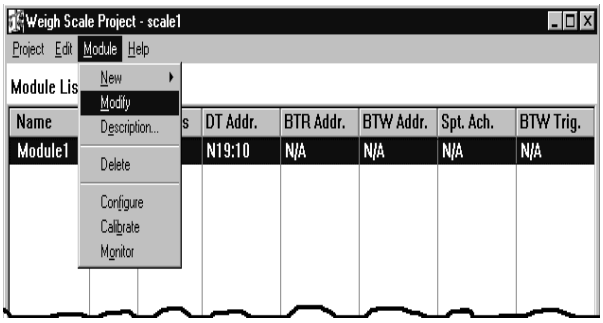
Modifying the Module List Screen

Once you have added modules to the Module List screen, you can change the information you already entered.

Modifying an Existing Module

To change the name, PLC node, data table address, or port of an existing module, follow these steps:

1. On the Module List screen, select the module you want to modify by using your cursor to highlight it.
2. Select **Module...Modify**.



You see the Modify Module dialog with the current settings displayed.

3. Make the desired changes.
4. Click on OK.

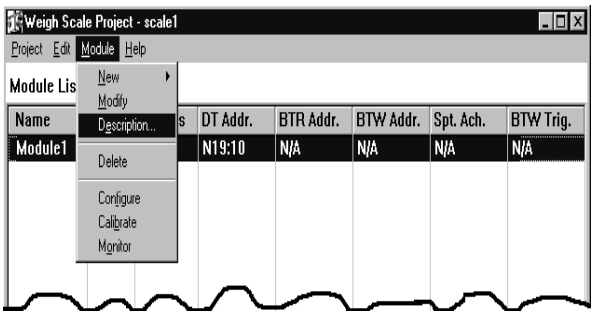
Entering or Modifying a Module Description

You can enter descriptive information for a module to be used when you print reports, such as:

- the manufacturing step where the module is used
- the physical location of the machine in which the module is used

To view, enter, or modify a description, follow these steps:

1. On the Module List screen, select the module you want to modify by using your cursor to highlight it.
2. Select **Module...Description**.



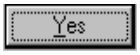
You see the Change Module Description dialog with the current settings displayed.

Change Module Description
Name: Module1
Description:
This module weighs incoming plastic pellets on injection molder 1 in Area 4.

3. Make the desired changes.
4. Click on OK.

Deleting a Module from the Module List Screen

To delete a module from the Module List screen, follow these steps:

1. On the Module List screen, select the module you want to delete by using your cursor to highlight it.
2. Select **Module...Delete**.
3. The software prompts you to confirm the delete. Select 

.

Saving Your Changes

You can save additions or changes you make to the Module List screen. When you save a project, the project file is written to your computer's hard disk, ***not*** to the PLC processor.

Downloading your project to the PLC processor

To write data to the PLC processor, you must download it from the Configuration, Calibration, or Monitor screens. We show you how in Chapter 8.

to	do this
save your changes	select **Project....Save**
save your changes with a different file name	select **Project....Save As**

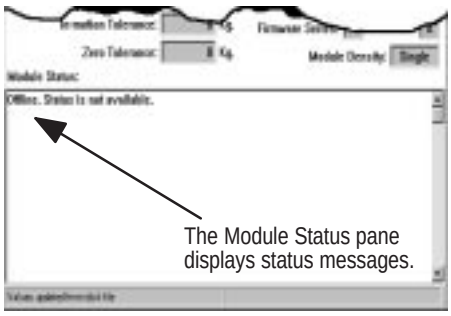
What to do Next

To help learn how to configure the WeighScale module, read Chapter 8, "Using WeighScale Configuration Software to Configure the Module."

Notes:

Using WeighScale Configuration Software to Configure the Module

WeighScale Configuration software lets you download configuration information directly to the PLC processor data table in online mode, or to a file on disk in offline mode. The software also lets you upload information from the processor or from a file. Once you have made your selections (described in this chapter), you should download the configuration information to the processor and to a file. We tell you how in this chapter.



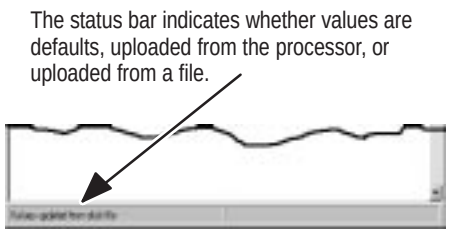
When you open the Configuration screen for a module you have just added to a project, the screen displays default values for all configuration parameters. The Module Status pane displays the message:

```
Offline. Status is not available.
```

Once you have changed the values and dowloaded the data to a file or the PLC processor (explained later in this chapter), the software no longer displays the default values when you open the Configuration screen. Instead, the software tries to read configuration values from the PLC processor so that the screen will always display the current values. If the configuration values are successfully read from the processor, the Module Status pane shows real-time status from the module.This information is updated every second.

If the software is not successful in accessing the PLC processor, (for example, if no communication link to the module exists), the software uploads configuration information from the offline file. The Module Status pane continues to report that status is not available.

While the software uploads information from the processor or the file, it checks that each value is within the allowable range for that particular parameter. If you are uploading data from a module that has never been configured, the data table will contain random data. Some values may be outside of the normal range. If the value is outside allowable limits, it is reset to the default value, and you see a warning message.



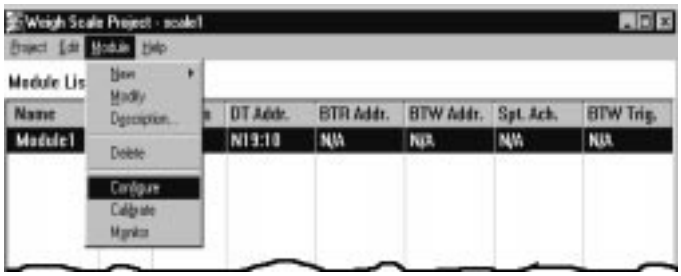
The status bar at the bottom of the window indicates whether the values displayed on the screen are defaults, uploaded from the processor, or uploaded from a file.

Important: The ModuleMonitor screen and theCalibration Wizard help you configure the module by interacting with an operating module. In offline mode, these tools will not work, nor will they access configuration information from a file. If you try to open the Monitor screen or Calibration Wizard without being connected to the processor, you see an error message, and the screen or wizard closes.

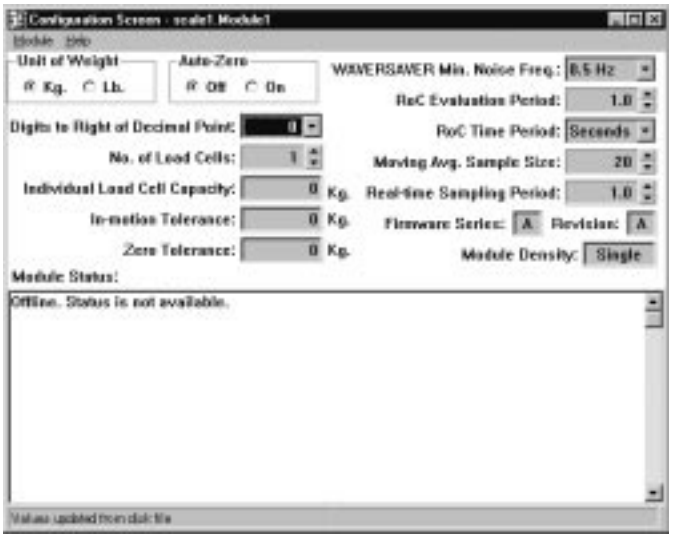
Using the Module Configuration Screen

Use the Module Configuration screen to enter and view configuration data for the WeighScale module.

1. On the Module List screen, select the module you want to configure by highlighting it.
2. Select **Module...Configure**. Or, with the mouse pointer over the Module pull-down menu, click the right mouse button to display a pop-up menu. Select **Configure**.



You see the Configuration screen.



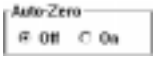
3. Enter or select information on the Configuration screen. We tell you more about the information you will need to configure the module in the following section.

Configuring the WeighScale Module

Follow these steps to use WeighScale Configuration software to configure the module.

Selecting the Unit of Weight

in this field	do this
Unit of Weight	select pounds (lb.) or kilograms (kg)



Selecting Auto-zero Tracking

in this field	do this
Auto-Zero	select on or off

Auto-zero tracking lets a scale automatically compensate for small variations at the zero point of the scale. These variations may be caused by slight material buildup on the scale platform or vessel, or by temperature fluctuations near the scale.

The auto-zero function automatically sets the gross weight to zero when:

- auto-zero is on
- the scale is not in motion (the weight on the scale is constant for a period of time), and
- the weight on the scale is near the calibration zero point (is in the active range)

For the scale to be considered not in motion, the weight on the scale must be constant (within the in-motion tolerance) for a period of:

1 second + (moving average sample size + 1) (0.05 seconds)

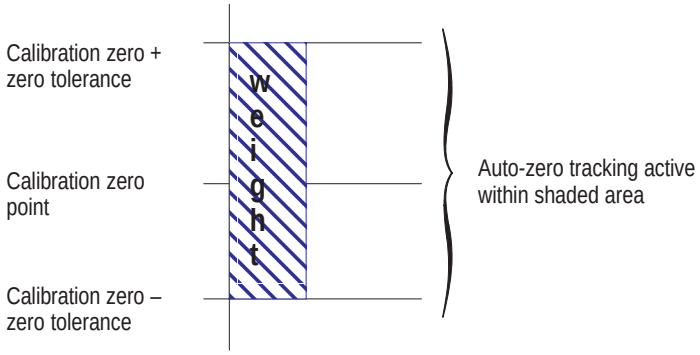
For example, if:

zero tolerance = 5 lb.
moving average sample size = 10
auto-zero tracking = on
weight is between – 5 lb. and +5 lb.
scale is motionless for 1.55 seconds

then gross weight = zero

This diagram shows the range of weight over which auto-zero tracking is active.

The calibration zero point determines the active range, not the current gross weight zero point. This prevents the scale zero from drifting from the true calibration zero point.


Calibration zero + zero tolerance
Calibration zero point
Calibration zero – zero tolerance
weight
Auto-zero tracking active within shaded area

Selecting the Number of Load Cells

in this field	do this
No. of Load Cells	enter the number of load cells used in the scale

Selecting the Decimal Point Location

in this field	do this
Digits to Right of Decimal Point	enter the number of digits (0 – 6) to the right of the decimal point you want to be displayed on all weight display and entry fields

When you select a decimal point location, you specify the number of digits (0 – 6) to be located to the right of the decimal point in weight display and entry fields. When you enter calibration or setpoint weights, you can enter only as many digits to the right of the decimal point as this setting specifies.

For example, if:

gross weight as measured by the scale = 90.7725765, and
decimal point location = 2

then gross weight displayed = 90.77

Important: When you change the decimal point location, calibration weight values are not automatically adjusted. You must recalibrate the scale. Failure to recalibrate the scale will result in gross and net weight displays being incorrect by a factor of whatever you changed the decimal point location to.

Determining the decimal point loacation

To determine the correct decimal point location, consider the following:

- Weight values are limited to six digits, regardless of the decimal point location. This means that if you specify 2 places to the right of the decimal point, the maximum weight you can display or enter is 9999.99.
- For most mechanical scales using load cells, the practical resolution limit is, at most, 1 part in 40,000. Changes smaller than this are rarely repeatable or accurate. Setting the decimal point location so large that one increment of the least significant digit represents a resolution finer than 1 in 40,000 will result in an unstable reading.
- Although WAVERSAVER circuitry helps minimize the effect of vibrations, scales in high shock or vibration environments should use the smallest possible decimal point setting.

Selecting the In-motion Tolerance Value

in this field	do this
In-motion Tolerance	enter the amount of weight change that will indicate to the module that the scale is in motion

As the module operates, it repeatedly reads the signals from the load cell(s) and calculates the weight value. When you change the weight on the scale, the scale requires a little time to stabilize at the new reading, since changing a weight can cause the scale to swing or vibrate slightly. If you tried to zero (or tare) the scale while it was still moving, the zero or tare value would be inaccurate.

The module determines when the scale is in motion, and will not allow you to zero or tare the scale while the scale is moving. You can specify the amount of weight change the module uses to decide if the scale is moving. When the module senses scale motion, it disregards certain functions when scale motion exceeds the parameters you set.

To specify the amount of weight change, enter a number (as many as six digits). The module subtracts the current weight reading from the previous weight reading. If the difference in the two values (ignoring the sign) is greater than the setting you entered, the scale is in motion. The module sets the in-motion bit in the data table.

Selecting the Zero-tolerance Value

in this field	do this
Zero Tolerance	enter the range above or below the calibration zero point where auto-zero tracking or manual zero is permitted

The zero-tolerance value defines a range of weights over which a manual or auto-zero is permitted. The zero point of a scale may vary slightly from what it was when the the scale was calibrated (the calibration zero point) due to causes such as:

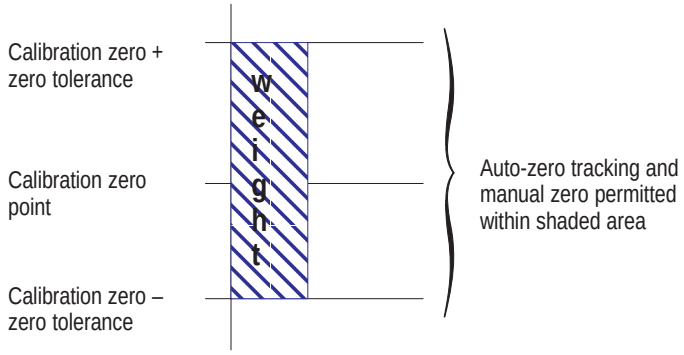
- mechanical wear
- material buildup
- temperature variations

You can use auto-zero and manual zero to compensate for normal variations without recalibrating the scale.

Important: If the variation from the calibration zero point grows too large, it may be an indication of a serious problem with the scale. Unless you identify and correct the problem, you may not be able to obtain accurate weight measurements.

To specify the zero-tolerance value, enter a number (as many as six digits) that represents the maximum variation from the caibration zero point that you can compensate for with a manual or auto-zero.

This diagram shows how the zero tolerance value affects the manual and auto-zero operation.



Selecting the WAVERSAVER Setting

in this field	select	to get this
WAVERSAVER Min. Noise Freq.	7.5 Hz	faster response to weight changes less stable readings increased noise in weight signal
	3.5 Hz	
	1.0 Hz	
	0.5 Hz	
	0.25 Hz	slower response to weight changes more stable readings decreased noise in weight signal

The WeighScale module includes a proprietary filter called WAVERSAVER that reduces the effect of noise or excess vibration in the weight signal. The filter rejects all variations in the weight signal above the minimum (or cutoff) noise frequency you set for your application.

You can select one of five minimum noise frequency settings based on your application needs. The chart above gives you an idea of the advantages and disadvantages of selecting a higher or lower minimum noise frequency.

Selecting Rate of Change Settings

The WeighScale module (Series B or later) calculates the rate at which the weight value is changing by measuring the weight at the beginning and end of a defined time period. The difference in weight divided by the time interval is the rate of change. This value can help control the rate at which an ingredient is added to a vessel, for example.

Selecting the Rate of Change Evaluation Period

in this field	do this
RoC Time Period	enter the rate of change of evaluation period in increments of 0.05 (or use the keys)

Set the time interval during which the module calculates weight change. You can enter an interval between 0.05 and 32.750 in increments of 0.05.

Rate of Change Evaluation Period setting	scale response
shorter evaluation period	faster updates of rate of change value value less stable and less accurate
longer evaluation period	slower updates of rate of change value value more stable and more accurate

Selecting the Rate of Change Time Period

in this field	do this
RoC Evaluation Period	select seconds, minutes, or hours

The rate of weight change is expressed in lb. or kg per second, minute, or hour, depending on your selections. Select seconds, minutes, or hours.

Selecting the Moving Average Sample Size

in this field	do this
Moving Average Sample Size	enter the moving average sample rate in increments of 1 or use the keys)

The WeighScale module reads the signal from the load cell and calculates weight every 50 milliseconds. To provide a more stable reading, the module can calculate a moving average using a sample size (from 1 – 200) you specify.

For example, if you set the moving average sample size to 10, each reading is added to the previous 9 readings and the sum divided by 10 to determine the current weight.

Moving Average Sample Size setting	scale response
larger sample size	slower response to weight changes more accurate reading (noise and variation may be reduced when more samples averaged)
shorter sample size	faster response to weight changes less accurate reading (noise and variation may increase when less samples averaged)

Selecting the Real-time Sampling Period

in this field	do this
Real-time Sampling Period	enter the real-time sampling period in milliseconds from 50 to 10000 in increments of 0.5 (or use the keys)

Enter a real-time sampling period in milliseconds to control the period during which the module places new weight values into the block transfer read block.

If a block transfer read is not executed within the real-time sampling period, the BTR time-out bit (bit 1 of word 0) in the status block is turned on. If a second BTR is executed within a real-time sampling period, the new data bit (bit 9 of word 0) in the status block turns off. This tells you that the values you just read in the block transfer have not been updated since the previous BTR.

Viewing the Module's Firmware Series and Revision

in this field	do this
Firmware Series	view the firmware series when uploaded from processor
Revision	view the firmware revision level when uploaded from processor

Viewing the Module Density

in this field	do this
Module Density	view whether the module uses single- or double-density mode

You can configure Series B and later WeighScale modules to use single- or double-density mode by setting a jumper within the module. We tell you how in Chapter 2 of this manual.

Viewing the Module Status

in this field	do this
Module Status	view real-time status information

On-line status information displays when the Configuration screen is opened, unless:

- the module has not been previously configured, or
- no communication link to the processor is available

WeighScale Configuration software displays messages about the status of the module, calibration and configuration:

- messages about downloaded data appear on the right side of the status bar on the Module Configuration screen
- messages about uploaded data appear on the left side of the status bar on the Module Configuration screen

Understanding Download Messages

These download messages are displayed on the right side of the status bar on the Configuration screen.

this message	means
Values written to disk file	you have successfully downloaded configuration data to a disk file
Values written to PLC	you have successfully downloaded configuration data to the PLC processor data table
Values written to PLC and file	you have successfully downloaded configuration data to the PLC processor data table and a disk file

Understanding Upload Messages

These upload messages are displayed on the left side of the status bar on the Configuration screen.

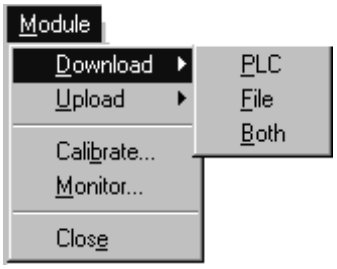
this message	means
Default values displayed	You see this message when you create a new module on the Module List screen, then access the Configuration screen. Default values are displayed on the Configuration screen until you perform an upload or download.
Values updated from PLC	you have successfully uploaded configuration data from the PLC processor data table
Values updated from disk file	you have successfully uploaded from the disk file
Corrupt data uploaded from PLC (default values displayed)	the application has found invalid configuration information in the PLC processor data table, and is displaying default values for corrupt data
Values updated from clipboard	you have cut or copied configuration values from a module to the clipboard, then pasted the values into a selected module on the Module List screen

Understanding Configuration Messages

You see these pop-up messages on the Configuration screen.

if	then
you have made configuration changes and try to close the Configuration screen	you are prompted to download your changes
you performed an upload from the PLC processor and the PLC data table contains invalid configuration values	When you click , default values will replace corrupt values on the Configuration screen. Verify configuration data and download it to the PLC processor.

Downloading Configuration Values



All configuration settings you make take effect only when you download to a file or to the PLC processor.

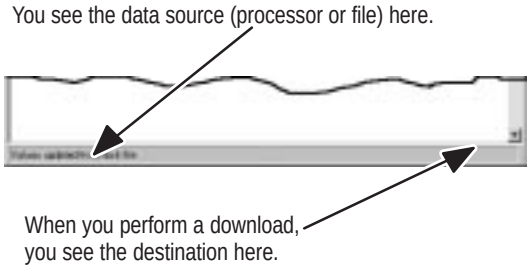
Important: We recommend that you download configuration information to the processor and to a project file. When you download to a project file, configuration information is stored with the project file. You can use the file to restore lost or damaged configuration data to the processor.

Important: To use online mode to download configuration information, you must have a Data Highway™ Plus, serial, or Ethernet connection to the PLC processor, and INTERCHANGE or RSLinx software must be installed and running. Use RSLinx with Ethernet connections.

Follow these steps to download configuration information.

1. On the Module Configuration screen, select **Module...Download...PLC** **Module...Download...File** or **Module...Download...Both**

to download configuration values to	select
the PLC processor data table block to be transferred via ladder logic to the WeighScale module	**Module...Download...PLC**
disk to be uploaded as needed	**Module...Download...File**
both the PLC processor and a file	**Module...Download...Both**



2. View the right-hand side of the status bar to confirm that the values were downloaded.

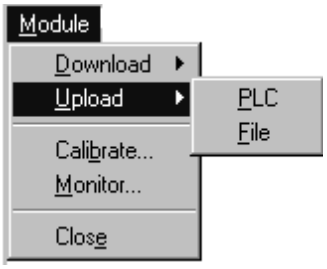
Downloading tips

Downloading to a file lets you perform configuration functions while your development computer is disconnected from the PLC processor. When you connect your development computer to the processor, you can transfer information between the file and the processor.

Downloading only to the PLC processor may be useful when you are testing changes. The file will retain your unaltered settings. If you want to revert to the unaltered settings, do the following:

1. Upload the configuration information from the file.
2. Download the configuration information to the PLC processor.
3. When you are done making changes, download them to the file to save them.

Uploading Configuration Values



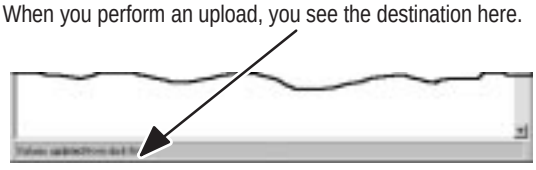
When you first select a project to open, configuration data you previously downloaded is uploaded automatically. You can perform a manual upload at any time, however. This is useful, for example, when you want to transfer data stored in the file to the processor.

Follow these steps to upload configuration information.

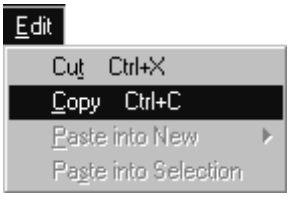
1. On the Module Configuration screen, select **Module...Upload...PLC** or **Module...Upload...File**

to upload configuration values from	select
the PLC processor data table block	**Module...Upload...PLC**
disk to be downloaded as needed	**Module...Upload...File**

2. View the left-hand side of the status bar to confirm that the values were uploaded.



Copying Configuration Values Between Modules

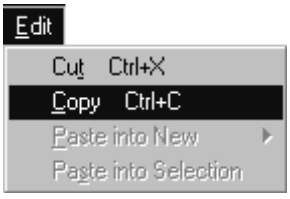


If you have several modules with similar (or identical) configurations, you can configure one module, then use that module to configure other similar modules. This procedure assumes that you have already added the destination module to your project (see Chapter 6 of this manual).

To copy configuration data from one module to another:

1. On the Module List screen, select the source module by highlighting it.
2. Select **Edit...Copy**.
3. Select the destination module by highlighting it. The destination module can be in the same project or a different project.
4. Select Edit...**Paste Into Selection**.
5. Access the Configuration screen for the destination module. From the Configuration screen:
   - **A.** View the pasted data.
   - **B.** Make any required changes.
   - **C.** Download configuration information to:
     - the PLC processor
     - a file, or
     - both the processor and a file

Copying Configuration Values into a New Module When You Are Using the Ladder Logic Utility



If you have several modules with similar (or identical) configurations, you can configure one module, then use that module to configure other similar modules.

To copy configuration data from one module to another when using the ladder logic utility:

1. On the Module List screen, select the source module by highlighting it.
2. Select **Edit...Copy**.
3. Select **Edit...Paste Into New...Use Utility**.

4. Enter this information

in this field	type
Name	the name of the module (you cannot use spaces; however, you can use underscores)
PLC Address	the PLC processor Data Highway node address (does not apply to serial connection, but you must still specify a node address)
Series	the module series (the ladder logic utility is supported by Series B or later)
DT Address	the data table starting address

5. Once you have entered information, click on OK.

6. Access the Configuration screen for the destination module. From the Configuration screen:

   A. View the pasted data.

   B. Make any required changes.

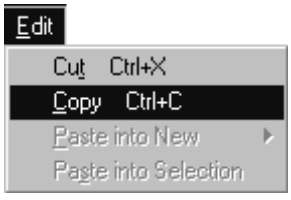
   C. Download configuration information to:

   - the PLC processor
   - a file, or
   - both the processor and a file

Copying Configuration Values into a New Module When You Are Not Using the Ladder Logic Utility

If you have several modules with similar (or identical) configurations, you can configure one module, then use that module to configure other similar modules.

To copy configuration data from one module to another when you are not using the ladder logic utility:



1. On the Module List screen, select the source module by highlighting it.
2. Select **Edit...Copy**.
3. Select **Edit...Paste Into New...Do Not Use Utility**.

4. Enter this information:

in this field	type
Name	the name of the module(you cannot use spaces; however, you can use underscores)
PLC Address	the PLC processor Data Highway node address(does not apply to serial connection, but you must still specify a node address)
Series	the module series
BTR Data Address	the starting address for the PLC processor block transfer read data
BTW Data Address	the starting address for the PLC block transfer write data
Setpoint Achieved Address	the address of the PLC processor data table word where your ladder logic copies the setpoint status bits from the input image file
BTW Trigger Bit Address	the address of the PLC processor data table bit that triggers a block transfer write

5. Click on OK. The module is added to the list.

6. Access the Configuration screen for the destination module. From the Configuration screen:

   A. View the pasted data.

   B. Make any required changes.

   C. Download configuration information to:

   - the PLC processor
   - a file, or
   - both the processor and a file

What to do Next

To help learn about how to calibrate the WeighScale module, read Chapter 9, “Using WeighScale Configuration Software to Calibrate the Module.”

Using WeighScale Configuration Software to Calibrate the Module

WeighScale Configuration Software provides you with three types of calibrations:

use this type of calibration	to calibrate the scale by
hard	physically measuring low and high weights
soft	entering sensitivity and resistance values for each load cell
C2	automatically uploading sensitivity and resistance values from Hardy Instruments load cells

Before You Begin

Before you can calibrate the module:

- you must configure the module (see Chapter 8 of this manual)
- you will need the following:

to perform this type of calibration	you will need
hard	• an accurate, known weight near the maximum scale capacity to use as the high weight • optional: an accurate, known weight between 0 and the high weight
soft	the sensitivity and output resistance values for each load cell in your scale (from the manufacturer's specifications or the load cell certificate)
C2	Hardy Instruments' load cells compatible with C2 calibration

Which Type of Calibration is Best for Your Application?

You can accurately calibrate a scale using any of the three methods we describe in this chapter. The three methods differ in ease of use and information and supplies required. We describe the benefits of each type of calibration here.

C2 Calibration

C2 calibration is the easiest of the three calibration types, since only one test weight (which can be zero) is required. C2 calibration requires that you use Hardy Instruments' load cells, however.

Soft Calibration

Soft calibration, like C2 calibration, requires only one test weight. You can use soft calibration on any manufacturer's load cells. You need to know the sensitivity and output resistance for all your load cells. You can get this information from the manufacturer's specifications, or the load cell certificate.

Hard Calibration

Hard calibration requires two or three accurate, known test weights. You can use hard calibration on any manufacturer's load cells. You ***do not*** need to know the sensitivity and output resistance for your load cells.

Achieving calibration accuracy

If you are using only a portion of your scale's range, you can achieve the greatest calibration accuracy by:

- performing a hard calibration
- choosing low, middle, and high test weights that cover the operating portion of your scale's range

For example, if you are using a 10,000 lb. scale, but use it in the range of 2,000 – 5,000 lb., you could use test weights of 2,000, 3,500, and 5,000 lb.

Accessing the Calibration Wizard

Follow theses steps to access the Calibration Wizard.

from	do this
the Module List screen	**1.** Select the module you want to calibrate by highlighting it. **2.** Select **Module...Calibrate.** or click the right mouse button, then select **Calibrate**
the Configuration screen	select **Module...Calibrate**

Gross and net weight displays

The Calibration Wizard displays the gross and net weight in real-time values. These values are updated constantly in the active window. The Calibration Wizard also displays the unit of weight you selected in configuring the module. The Calibration Wizard allows you to enter calibration weight values in the units you selected.

Previous calibration date and ID

The Calibration Wizard displays the date of the last successful calibration, and the ID that was used. The ID value is provided so you can identify the person performing the calibration. It is not used by the module. The ID can be as many as four alpha-numeric characters.

Module status

The Calibration Wizard displays real-time status messages from the module.

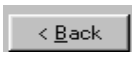
Enabling buttons

A button appears gray when it is disabled. When you are instructed to click on a button on the screen, you may have to wait as many as 15 seconds before the button is enabled. Buttons are not enabled until all conditions are right to continue.

Advancing to the next step

If the wizard does not appear to advance to the nest step, check the Status pane for error messages.

Going back to a previous page

You can go back to a previous page by clicking the 

button. When you go back, you must repeat all steps on the previous and subsequent pages.

Performing a Hard Calibration

Follow these steps to perform a hard calibration.

1. If you have not already done so, access the Calibration screen.

2. In the ID field, enter an ID you select. The ID can be as many as four alpha-numeric characters or spaces.
3. Select the Hard Calibration radio button.
4. Click on Next >.
5. Place a low calibration weight (the weight could be zero) on the scale.
6. Enter the low calibration weight in the appropriate field.
7. Click on Accept. After 12–15 seconds, you see a message telling you the low calibration weight has been accepted.
8. Click on Next >.

Optional: You are not required to enter a midpoint linearization weight. Doing so is useful for ensuring more accurate weighing.

9. Place a midpoint linearization calibration weight on the scale.
10. Enter the midpoint linearization calibration weight in the appropriate field.
11. Click on Accept. You see a message telling you the midpoint linearization calibration weight has been accepted.
12. Click on Next >.
13. Place the high calibration weight on the scale.

Selecting a high calibration weight

We recommend that you select a high calibration weight value that is 80–100% of the scale capacity.

14. Enter the high calibration weight in the appropriate field.

15. Click on Accept. After about 12–15 seconds, you see a message telling you the high calibration weight has been accepted.

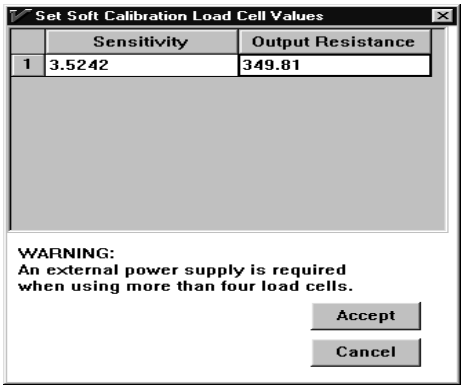
16. Click on Next >. You see the Accept Values screen.

to	click on
store the values you entered in the module's non-volatile memory	Accept
discard the values you entered	Cancel

Performing a Soft Calibration

Follow these steps to perform a soft calibration.

1. If you have not already done so, access the Calibration screen.
2. In the ID field, enter an ID you select. The ID can be as many as four alpha-numeric characters or spaces.
3. Select the Soft Calibration radio button.
4. Click on Next >.
5. Click on Set Soft Calibration Values. You see the Set Soft Calibration Load Cell Values screen.



6. Enter the load cell's sensitivity and output resistance from the manufacturer's specifications, or the load cell certificate.

   A numbered field is displayed for each load cell you are using. You can enter the values in any order as long as you enter the sensitivity and output resistance values for a given load cell in the same numbered field.

enter sensitivity values in units of	and within this range	enter output resistance in units of
millivolts per Volt of excitation (m V/V)	0.5–4.0m V/V	ohms

to	click on
accept the sensitivity and output resistance values	Accept
discard the values you entered	Cancel

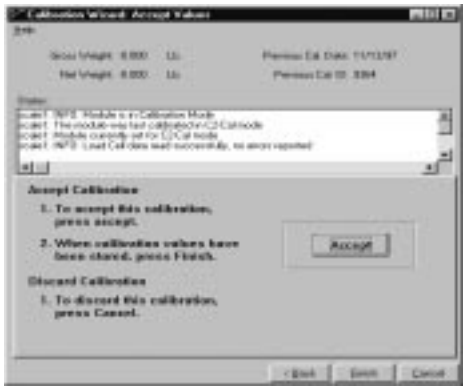
7. Place a low calibration weight (the weight could be zero) on the scale.
8. Enter the low calibration weight in the appropriate field.
9. Click on Accept. After about 12–15 seconds, you see a message telling you the low calibration weight has been accepted.
10. Click Next >. You see the Accept Values screen.

to	click on
store the values you entered in the module's non-volatile memory	Accept
discard the values you entered	Cancel

Performing a C2 Calibration

Follow this procedure to perform a C2 calibration.

1. If you have not already done so, access the Calibration screen.
2. In the ID field, enter an ID you select. The ID can be as many as four alpha-numeric characters or spaces.
3. Select the C2 Calibration radio button.
4. Place a low calibration weight (the weight could be zero) on the scale.
5. Enter the low weight in the appropriate field.
6. Click on Next >. After about 12–15 seconds, you see the a message telling you the low calibration weigh has been accepted.



7. Click on Next >. You see the Accept Values screen.

to	click on
store the values you entered in the module's non-volatile memory	Accept
discard the values you entered	Cancel

8. When calibration values have been stored, you see a status message. Click on Finish.

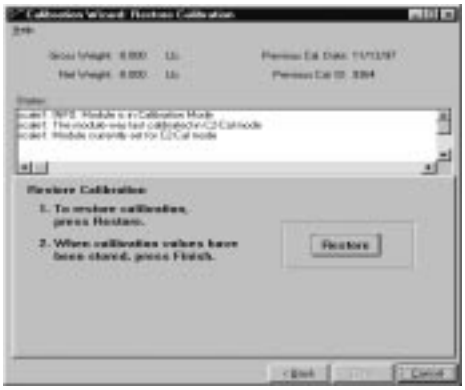
Restoring a Calibration

The WeighScale module always saves the last successful calibration to its non-volatile memory. When you want to replace an existing WeighScale module with a new one without calibrating the module, you can restore a previously saved calibration. You can also restore a calibration when you want to use the previously saved calibration instead of one you are currently working on, or to replace calibration data from a failed module.

Important: You should only restore a calibration as a short–term solution for replacing a failed module. Weight readings obtained from a module whose calibration was restored from another module may not be as accurate as readings from the original module. After you have replaced the failed module, recalibrate it as soon as possible.

To restore a calibration, follow these steps.

1. If you have not already done so, access the Calibration screen.
2. In the ID field, enter an ID you select. The ID can be as many as four alpha-numeric characters or spaces.
3. Select the Restore Calibration radio button.


Restore Calibration
1. To restore calibration, press Restore.
2. When calibration values have been stored, press Finish.
Restore

4. Click on Next >. You see the Restore Calibration screen.
5. Click on Restore.
6. When calibration values have been stored, click on Finish.

Reading Resistance

To isolate problems with the module, or with the external load cells or wiring, you can read the WeighScale module's internal resistance. During factory testing and calibration, the module is set to read the value of an internal resistor. This resistance is stored in the module's non-volatile RAM. When you want to test the module, follow this procedure:

1. If you have not already done so, access the Calibration screen.
2. In the ID field, enter an ID you select. The ID can be as many as four alpha-numeric characters or spaces.
3. Select the Read Resistance radio button. You see the Read Counts screen. As the internal resistor is read, the software displays the resistance count.

4. Verify that the count stabilizes after 10 – 15 seconds.

if	then
the resistance count is within acceptable tolerance of the stored value (count stabilizes after 10 – 15 seconds), and a test resistance failure does *not* occur (status block word 1, bit 13 is *not* set)	The module is operating properly. If you still experience problems, the load cells or wiring may be bad, and may need to be replaced.
a test resistance value failure occurs (status block word 1, bit 13 is set)	The value is out of tolerance. You see an error message in the status window on the screen. The module is not operating properly. Contact your Rockwell Automation representative.

5. When you are finished reading resistance, click on Finish.

What to do Next

To help learn how to interpret status information returned by the WeighScale module, read Chapter 10, "Using the Module Monitor Screen."

Using the Module Monitor Screen

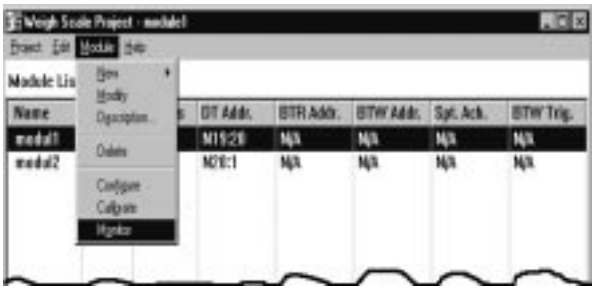
This chapter tells you how to monitor and control WeighScale module operation using the Monitor screen. You can also view status data directly from the data table. See Appendix C of this manual for more information on monitoring status data from the data table.

Accessing the Monitor Screen

To monitor and control a module, access the Monitor screen.

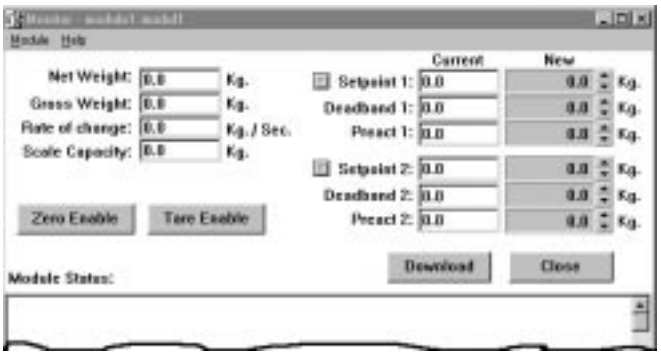
1. On the Module List screen, select the module you want to monitor by highlighting it.
2. Select **Module...Monitor**.

Or



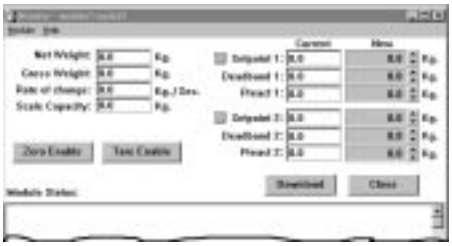
1. With the mouse pointer over the module list, click the right button to display the pop-up Module menu.
2. Select **Monitor**.

You see the Monitor screen.



Viewing or Entering Data

View or enter data on the Monitor screen.



in this field	do this
Net Weight	view the net weight on the scale (net weight = gross weight – tare weight)
Gross Weight	view the gross weight on the scale
Rate of Change	view the rate at which weight on the scale is changing
Scale Capacity	view the maximum scale capacity (determined by multiplying the number of load cells by the individual load cell capacity)
Module Status	view status messages, warnings, and errors from the module
Zero Enable/Disable	Press the button to toggle the zero enabled/disabled function. The gross weight is set to zero when the zero function is enabled, the scale is not in motion, and the gross weight is within the zero tolerance value specified on the Configuration screen. If security is enabled, you must have the Perform Tare or Zero privilege to perform this operation.
Tare Enable/Disable	Press the button to toggle the tare enabled/disabled function. When the tare function is enabled and the scale is not in motion, the tare value is continuously set to the gross weight. This results in anet weight of zero.
Close/Cancel	Press the button when it is labeled “Close” or “Cancel” to close the screen. If you press the button when it is labeled “Cancel”, you see a message warning you that setpoint, deadband, and preact values have been changed but not downloaded.

Series B only

These field are active only with Series B or later modules.

in this field	do this
Current Setpoint 1 Current Setpoint 2	view the current values for setpoints 1 and 2
Setpoint 1 indicator Setpoint 2 indicator	View the indicator (glows red when the corresponding setpoint status output from the module is on). This occurs when the net weight is greater than the setpoint plus the preact value.
Current Deadband 1 Current Deadband 2	view the weight value in use for deadbands 1 and 2
Current Preact 1 Current Preact 2	view the weight value in use for preacts 1 and 2
New Setpoint 1 New Setpoint 2	enter a new value for setpoint 1 or 2 (takes effect after it has been downloaded to the module)
New Deadband 1 New Deadband 2	enter a new value for deadband 1 or 2 (takes effect after it has been downloaded to the module)
New Preact 1 New Preact 2	enter a new value for preact 1 or 2 (takes effect after it has been downloaded to the module
Download	Press the button to download new setpoints, deadbands, or preacts to the PLC processor. If security is enabled, you must have the Update Setpoints privilege to perform this operation.

What to do Next

To help learn how to produce a printed report for you project or module, read Chapter 11, “Documenting Projects.”

Notes:

Documenting Projects

This chapter shows you how to use WeighScale Configuration software to view or print descriptive reports for each project or module, as well as the values of all configuration parameters.

Each section of the report includes:

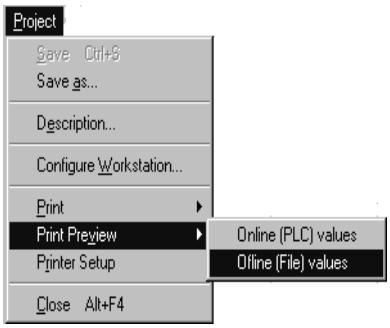
- a header showing the name of each item and its descriptive information
- a list of all parameters
- the current value of each parameter

The reports can display data values:

- on-line (from the PLC processor), or
- offline (from a file)

to	do this
view reports on screen	use the print preview option (select **Project...Print Preview**)
print reports to a printer attached to your computer	use the print option (select **Project...Print)**

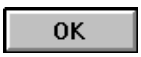
Viewing a Project



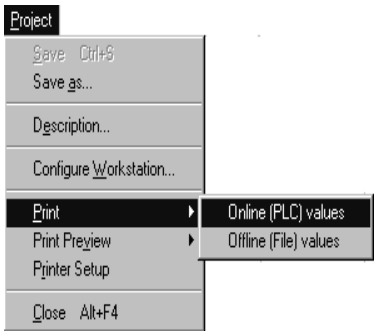
To view a project:

1. On the Project Manager screen, select the project you want to view by highlighting it.
2. View the project on-line or offline.
   - **A.** To view values from the PLC processor, select **Project...Print Preview...Online (PLC) Values**.
   - **B.** To view values from a file, select **Project...Print Preview...Offline (File) Values**.
3. On the print dialog box that appears, click on one of the following:

to	click on
include all modules in the project in the report	
include only the selected module in the report	

4. Click on  . The file is displayed on the screen.

Printing a Project



To print a project:

1. On the Project Manager screen, select the project you want to print by highlighting it.
2. Print the project on-line or offline.
   - **A.** To print values from the PLC processor, select **Project...Print...Online (PLC) Values**.
   - **B.** To print values from a file, select **Project...Print...Offline (File) Values**.
3. On the print dialog box that appears, click on one of the following:

to	click on
include all modules in the project in the report	
include only the selected module in the report	

4. Check that all printer information is correct, and click on .

What to do Next

To help learn how to troubleshoot the module, read Chapter 12, “Troubleshooting the Module.”

Troubleshooting the Module

This chapter gives you information for troubleshooting your system. We list these in order of ease of performing and likelihood of helping you isolate the problem.

Diagnostics Reported by the Module

At power-up, the module checks for:

- correct RAM operation
- EPROM operation
- EEPROM operation

During this self-diagnostic check, the RUN/FLT (fault) indicator flashes green at a rate of 5 to 10 times a second. (We show the indicators in Figure 12.1.) This self-diagnostic check lasts from 2 to 30 seconds, depending on the WAVERSAVER™ selection; the lower the frequency, the longer the time.

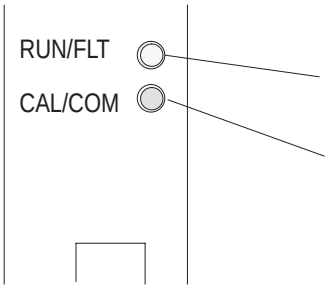
When it completes this check satisfactorily, the RUN/FAULT indicator stops this rapid flashing. However, if the module does not have valid calibration data, the RUN/FAULT indicator flashes green at a rate of once a second.

When it completes this check satisfactorily and the module has valid calibration data, the RUN/FAULT indicator becomes a steady green. If a fault is found initially or occurs later, the RUN/FAULT indicator turns red.

The bottom indicator is the calibrate/communication indicator:

- This indicator flashes green when doing block transfers
- It flashes red during calibration

Figure 12.1
Indicators



indicator	when green	when red
RUN/FAULT	**flashes 5HZ** — during self check at power-up **flashes 1HZ** — after self check until valid calibration **solid** — after self check and valid calibration	**solid** — a fault is found
CAL/COM	**flashes** — during block-transfer	**flashes** — during calibration

Troubleshooting with the Indicators

Table 12.A shows indications, probable causes and recommended actions to correct common faults which may occur.

Table 12.A
Troubleshooting Chart

indication	probable cause	recommended action
Both indicators are OFF	No power to module	Check power to I/O chassis. Recycle as necessary.
	Possible short on the module LED driver failure	Replace module.
RUN/FLT indicator ON red	Microprocessor, oscillator or EPROM failure	Replace module.
	If immediately after power-up, indicates RAM or EPROM failure.	Replace module.
	If during operation, indicates possible microprocessor or backplane interface failure.	Replace module.
RUN/FLT indicator is flashing green at 5–10Hz	Power–up diagnostics in progress.	Normal operation for the first 2 to 30 seconds.
RUN/FLT indicator is flashing green at 1Hz, but CAL/COM indicator is off	Power–up diagnostics successfully completed, but no valid calibration data.	Calibrate the module.
RUN/FLT indicator is solid green	Power-up diagnostics successfully completed, and valid calibration data on board.	Normal operation.
CAL/COM indicator is flashing green	Block transfer in progress.	Normal operation.
CAL/COM indicator is flashing red	Calibration in progress.	Normal operation.

Reading On-board Resistance

To read on-board resistance, using either WeighScale software, or bit 9 of word 32 in the write block, select to connect the on-board resistance across the sense and signal lines:

if the weight reading with this resistance connected is	then
not stable and repeatable	replace the WeighScale Module with a spare
stable and repeatable	the input section of the module is functioning correctly; try connecting a simulator

Checking Resistance with a Simulator Connected

To perform resistance checks with a simulator connected:

1. Remove all power from the remote termination panel by disconnecting the cable from the module.
2. Disconnect the load cell cable or junction box cable from the remote termination panel.

3. Connect a load-cell simulator to the remote termination panel.

   Follow the color code of the simulator, and if possible, connect it in the same configuration you used for the load cell. (See Figures 2.3, 2.4, and 2.5.) If the simulator cannot be connected in the same configuration as the load cell, connect it in the configuration for which it is intended.

4. With all power removed and the cable from the module disconnected, at the remote termination panel, check the resistance from +excitation to –excitation and from +signal to –signal.

5. Compare these values with the resistance ratings of your simulator.

6. If the resistance values you read don't match the ratings of your simulator, re-check your wiring.

7. If you are satisfied that your wiring is OK and the resistance values you read don't match the ratings of your simulator, replace the simulator.

8. If the resistance values you read match the ratings of your simulator, reconnect the cable from the module to the remote termination panel and check the block-transfer communication with the PLC processor.

Checking Block-transfer Communication

To check the block-transfer communication with the PLC processor:

1. Check to see that the block-transfer addressing is consistent with the addressing mode (½-slot, 1-slot, or 2-slot) on the I/O chassis containing the Weigh Scale Module.
2. Ensure that the words in the block-transfer control structures and read and write blocks in the data table are not being written over by some other ladder logic.
3. Check for errors reported in the block-transfer control structures.

   If you are addressing the module correctly and are receiving block-transfer error indications, replace the Weigh Scale Module with a spare.
4. Read the value in read-block words 26 and 27 as you change the output of the simulator.

   If this value does not change, check the status of bits 3 and 4 in word 0 of the read block. If either of these bits is on (indicating over range of under range), recheck the wiring to the simulator. If the counts in words 26 and 27 changes as you change the output of the simulator, the block-transfer communication is OK:

for this simulator	you will see a change of approximately
0-20mV/V	656,000 counts as you adjust the simulator from 0 to 100%
0-30mV/V	985,000 counts as you adjust the simulator from 0 to 100%

Calibrating the Module to the Simulator

Once you have established communication between the PLC processor and the Weigh Scale Module, calibrate the module to the simulator. If you use the WeighScale software to configure the module, check the status messages displayed on the calibration screen. If you use ladder logic to directly manipulate the write block to configure the module, check the status values in the read block. If you cannot calibrate the module at this point, replace the Weigh Scale Module with a spare. If you can calibrate the module, the module is probably OK; reconnect the load cell.

Checking Resistance of the Scale System

To perform resistance checks of the scale system:

1. Remove all power from the remote termination panel by disconnecting the cable from the module.
2. Disconnect the simulator from the remote termination panel.
3. Reconnect the load cell or junction box to the remote termination panel.
4. With all power removed and the cable from the module disconnected, at the remote termination panel and the junction box, check the resistance from +excitation to –excitation and from +signal to –signal.
5. Compare these values with the resistance ratings of your load cells.

   Remember that if you have multiple load cells connected through a junction box, they are connected in parallel; therefore the total resistance would be:

$$R_T = \frac{R_L}{N}$$

Where:
R_T = the total resistance
R_L = the resistance per load cell
N = the number of load cells

For example, if 4 load cells are each rated at 350.0Ω, the total resistance would be 87.5Ω at the junction box. If the distance between the junction box and the remote termination panel is significant, the resistance measured at the remote termination panel because of resistance in the wiring. If the resistance doesn't match the rating and the wiring is OK, replace load cells until you find the one that is faulty. If the resistance does match, check the load-cell mounting.

Checking Load-cell Mounting

Check to see that none of the load cells are mounted upside down. By load cell, we mean specifically the device in which the strain gage is mounted — not the mounting assembly. Also check to see that the load cells are free from any binding. If the mounting seems to be OK, try disconnecting the piping.

Calibrating with Piping Disconnected

Try calibrating the module with piping disconnected:

1. Disconnect all piping from your vessel.
2. Try to calibrate the module and test your calibration with weights:
   - If you are still unable to calibrate your module, recheck the load-cell mounting
   - If you are able to calibrate the module, continue
3. Reconnect one pipe.
4. Try to calibrate the module and test your calibration with weights.
5. Continue reconnecting one pipe at a time and trying to recalibrate each time until you find any point that may be binding on your vessel.

Troubleshooting Load Cells

Inspect each load cell for physical damage. Look for distortion or cracks in all metal parts. Excessive rippling of the diaphragm on a canister may indicate damage. All welds should be free of cracks and deep pox marks. Cables should also be free of cuts, crimps, and excessive abrasion. Make note of anything that looks out of the ordinary.

The following three electrical tests can be useful in troubleshooting potential load-cell problems.

Zero Balance Test

Changes in zero balance can be caused by overloading the load cell. Some changes may be tolerated in some applications.

With a milli-voltmeter, measure the load cell output under no-load conditions. It should be less than 1% (the typical tolerance for zero balance) of the full scale output. (Check the specification for zero balance tolerance and output sensitivity.) Cells can shift as much as approximately 10% of full scale and still be correctly functioning. Re-gaging may be recommended if the output has shifted more than 10%.. A typical value for a 1% shift in zero balance is 0.3mV. This assumes 10V excitation on a load cell with 3mV/V output sensitivity. Full scale output with these conditions is 30mV. One percent of 30mV is 0.3mV.

Bridge Resistance

Changes in bridge resistance are most often caused by a failure of a compensating element or by a broken or burned bridge wire,, usually caused by an electrical transient such as lightning. Either type of failure must be repaired.

With an ohmmeter, measure the resistance across each pair of input and output leads. The values are the input and output resistance of the bridge. The resistance is normally approximately 350Ω for single-ended beams and canisters and 700Ω for double-ended beams. Refer to the load-cell drawing or data sheet for actual specified values. Readings should be within 1.0% of specified values. Reading outside of this tolerance suggest damage; thoroughly inspect the load cell.

Resistance to Ground

Electrical leakage is usually caused by water contamination within the load cell or cables. Whether the leakage can be tolerated depends on the application and the electronic instrumentation being used. An unstable output is most often caused by contamination.

With a megohmmeter, measure the resistance between all 5 leads tied together (4 live leads plus the ground lead) and the metal body of the load cell. The reading should be 500 megohms or more. If the cell fails this test, remove the ground wire and test with only the 4 live leads. If it tests OK with the ground wire removed after failing with the ground wire included, the cable probably has an insulation problem.

Repairing failed load cells

If the load cell needs to be returned to the factory for further examination or repair, be as detailed in the description of the failure as possible. As an example, if the load cell has drifted, mention the circumstances. Does it drift with load, without load, under temperature variation, etc.? Only factory technicians should perform any additional tests and make repairs.

Notes:

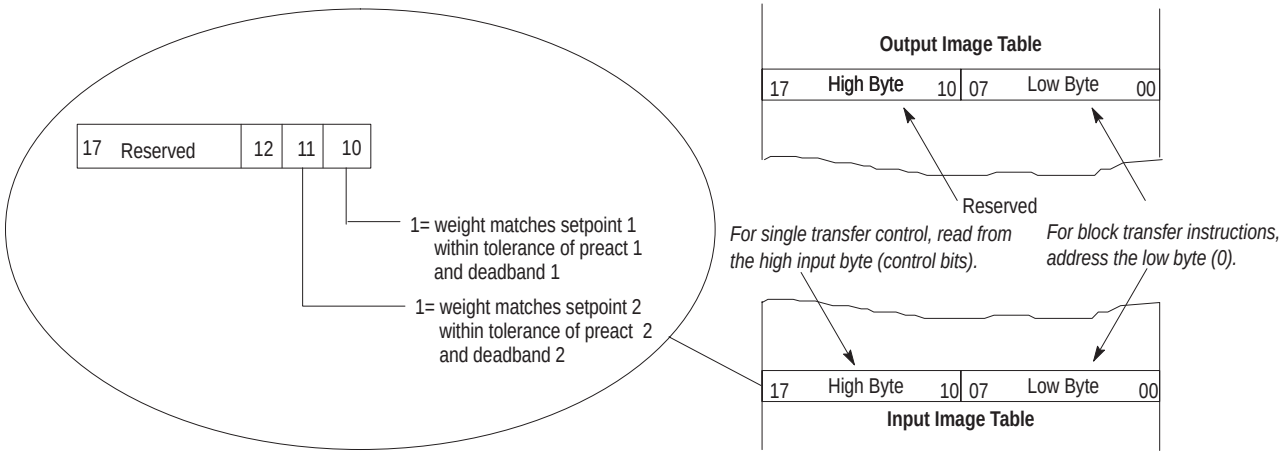
Writing Custom Ladder Logic

In this chapter, we describe what you need to know to write custom ladder logic for the WeighScale module.

▶ Also refer to Appendix B, “Editing the Configuration/Calibration Block.”

Addressing the WeighScale Module

In double density (Series B) mode, I/O data is both single and block transferred between the WeighScale Module and the PLC processor. The module uses a word of input image table and a word of output image table:


17 Reserved 12 11 10
1= weight matches setpoint 1 within tolerance of preact 1 and deadband 1
1= weight matches setpoint 2 within tolerance of preact 2 and deadband 2
Output Image Table
17 High Byte 10 07 Low Byte 00
Reserved
For single transfer control, read from the high input byte (control bits).
For block transfer instructions, address the low byte (0).
17 High Byte 10 07 Low Byte 00
Input Image Table

- The low byte of the input and output image word is used exclusively for block-transfer

if you configure the I/O chassis for	address the WeighScale Module through
½-slot addressing	**byte 0** of the **low I/O group** used for addressing the slot containing the module
1-slot addressing	**byte 0** of the I/O group used for addressing the slot containing the module

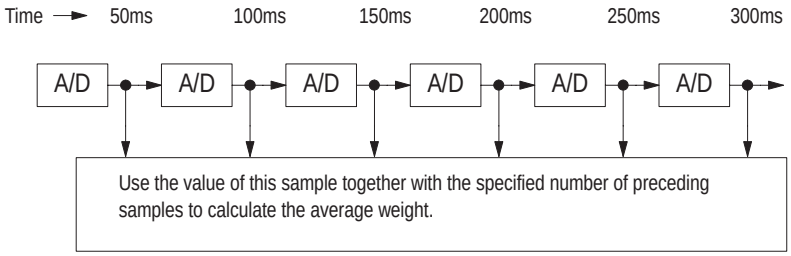
- The high byte of the output image word is not used
- The high byte of the input image word is used exclusively for single-transfer

read this bit	for
bit 10	comparison result for setpoint 1
bit 11	comparison result for setpoint 2

Updating Weight Values

The module's A/D conversion period is 50ms. After each A/D conversion, the value of that sample is used together with the value of each of a specified number of preceding samples to calculate an average weight value to place into the status block. The number of samples used to calculate the average weight is a value you specify (1 through 200) when you configure the module.

Important: Although a number of samples is used to calculate an average before a weight value is put into the status block, a new average is calculated after each sample is taken (every 50ms).



The module places a new average weight value into the status block each real-time sampling period. You specify this sampling period (50ms through 10,000ms in increments of 50ms) when you configure the module. (See Chapter 8, "Using WeighScale Configuration Software to Configure the Module" or Appendix B, "Editing the Configuration/Calibration Block.")

Although the module can place a new average weight value into the status block every 50ms, the amount of time it takes, in the worst case, before a change of weight at the load cell is fully reflected in the average weight reported in the status block is expressed by the formula:

$$T = S \times 50\text{ms} + R$$

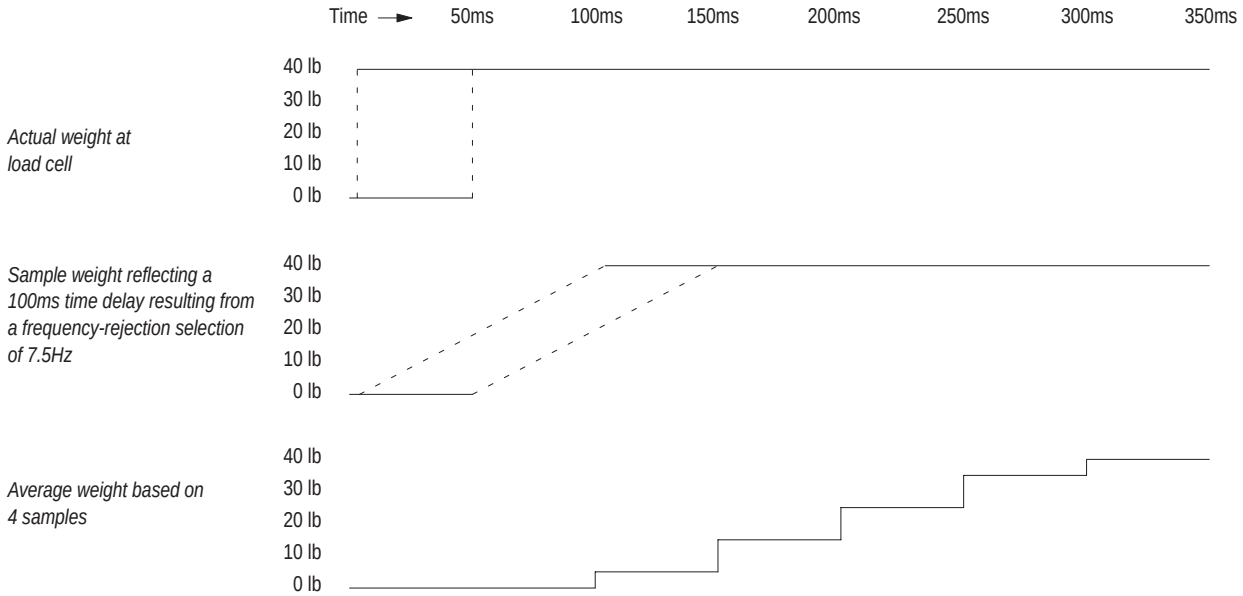
Where:

- ***T*** = the amount of time it takes before a change of weight at the load cell is fully reflected in the average weight reported in the status block
- ***S*** = the number of samples specified for the average
- ***R*** = the time delay based on the WAVERSAVER ™ frequency-rejection level you select as indicated in the following table:

if the WAVERSAVER frequency-rejection level is:	then:
7.50Hz	R = 0.1s
3.50Hz	R = 0.4s
1.00Hz	R = 0.8s
0.50Hz	R = 1.7s
0.25Hz	R = 3.3s

Update Example

Consider this example in which you have selected a real-time sampling period of 50ms, and the weight at the load cell instantaneously increases from 0 to 40 lb:



In this example, if you have selected a WAVERSAVER frequency-rejection level of 7.50Hz, the full change in weight is not reflected in the samples taken in the module until after a 100ms delay. With a selection of 4 samples used to calculate the average, this average weight entered into the status block does not reflect the actual weight of 40 pounds until 200ms later, or a total of 300ms after the weight change occurred at the load cell.

New Data

Real-time sampling lets you cycle data between the module and the PLC processor at a rate you specify. You set the real-time sampling period based on the required system response time and the rate at which the system can execute block-transfer reads. Set the real-time sampling period to be greater than the required system response time and less than the BTR period. (If you do not configure the real-time sampling period, the module uses the default setting stored in its memory.)

At the completion of each real-time sampling period, as newly calculated averages are entered into the status block, the new-data bit (bit 9 of word 0) in the status block is turned on. As each block transfer read is executed, the new-data bit is turned off.

If your ladder logic causes a second block transfer read to be executed within a real-time sampling period, the module will not respond. This tells you that the values you just read in that block transfer have not been updated since the previous block transfer read. This is an indication that you are unnecessarily using up I/O scan time without getting any new data.

The rate at which you need to execute block transfer reads is entirely dependent on how quickly a response is needed to a change in weight for your application.

Consider an application example in which you have determined that a total system response time of 1500ms is adequate, and the module is in a remote I/O chassis. In this example:

- the valve turn-off time is 200ms
- the I/O scan time is 20ms
- the program scan time is 35ms
- the time it takes to do the block-transfer read is 2 I/O scans plus 1 program scan plus 10ms for 29 words, for a total of 85ms
- the WAVERSAVER frequency-rejection level selected is 7.5Hz, and the number of samples selected for the weight averaging is 4, which generates a total time delay on the module of 250ms

For this example, if a block-transfer read were executed every I/O scan, the system response time would be:

$$T = (250 + 85 + 35 + 20 + 200) = 690ms$$

Therefore, for this application example you could set a real-time sample period of 900ms and use an 850ms timer to trigger the block-transfer read instruction to save I/O scan time and still meet the total system response time of 1500ms.

Real-Time Sample Period BTR Time-out

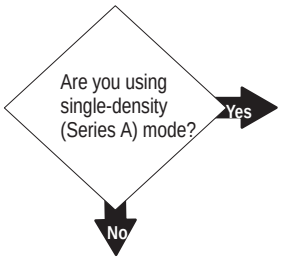
Once the module enters new data into the status block at the end of real-time sample period, it checks to see whether a block-transfer read occurs during the following real-time sample period. If none occurs, the module turns on the real-time sample period BTR time-out bit (bit 1 of word 0) in the status block.

If you find that the BTR time-out bit in the status block is turned on, you should either lengthen the real-time sample period or shorten the BTR period by trying to execute a block-transfer read more often. If you are using a timer to trigger the block-transfer read, set a smaller preset time in the timer. If you are attempting to execute a block transfer read on each program scan and you are still getting a time-out, you may be able to shorten the time between block transfer reads by either shortening the effective program scan or shortening the I/O scan.

You can shorten the effective program scan by repeating the BTR rung in the ladder logic. You can shorten the scan time of a remote I/O link by moving some I/O chassis from that remote I/O link to another remote I/O link. You can also shorten the I/O scan time for the WeighScale Module by moving it from a remote I/O chassis to a local chassis.

Calculating Flow

Giving you control over the real-time sampling period allows you to calculate flow or rate of change from the change in weight that you measure. To calculate flow, the real-time sampling period must be greater than the block transfer read period. If bit 1 of word 0 in the status block is set to 1, this indicates that a block transfer read did not occur within the real-time sampling period because the block transfer read period is too great. Therefore, the calculation is invalid. Also, you must disregard values from any block not identified as new data. The status block is identified as new data by bit 9 of word 0 being set to 1.



Use this formula:

$$F = \frac{W_C - W_P}{P}$$

Where:

F = flow
W_C = weight from current sampling period
W_P = weight from previous sampling period
P = real-time sampling period

You don't need to calculate the flow.

In double-density (Series B) mode, the module automatically calculates the rate-of-change value.

Setting up Communication

Comparison result bits 10 and 11 (octal) are returned by single transfers. All other communication with the WeighScale Module is by block transfer. Your ladder logic must provide the proper sequence of block transfer communication with the module.

1. At initial start-up, write (block transfer) the configuration/calibration block to the module from the processor.
2. Read (block transfer) the status block from the module continuously at a rate based on the period of time it takes for the module to update the weight values and the real-time sampling period you select.
3. Whenever you need to recalibrate the module, reconfigure the module, reset the tare value, or zero the gross weight, write (block transfer) the configuration/calibration block to the module.

Understanding how the module communicates

The pages that follow use programming examples to show you how you can communicate with the module.

Editing the Configuration/Calibration Block

if you're using this mode	the configuration/calibration block contains
single density (Series A)	33 words
double density (Series B)	64 words

In Chapter 8 and Chapter 9, we tell you how to enter the values for this block from the Configuration and Calibration screens. Most of this block is transparent to you.

We list the entire block in Appendix B for reference. However, words 0, 1, and 2 provide selections that you may want to change "on the fly" through your ladder logic from operator-panel switch inputs.

Setting the Block Transfer Write Trigger Address

You can generate block transfers to and from the WeighScale Module:

- To generate a block transfer *to* the 1771-WS module, your ladder logic must execute a block transfer write instruction
- To generate a blocktransfer *from* the 1771-WS module, your ladder logic must execute a block transfer read instruction

After you have edited your ladder logic file, you can use WeighScale Configuration software to specify the block transfer write trigger address and enable the bit.

These examples apply to a WeighScale Module located in the 0 slot of I/O group 1 of I/O rack 0 (the processor-resident local I/O chassis) with a configuration and calibration block starting at N140:100 and a status block starting at N140:150. Therefore, with these arbitrarily chosen starting addresses for these blocks and arbitrarily chosen addresses for digital I/O, we use the following addresses in these examples.

this	is the address of
N140:100	the first word of the configuration and calibration (write) block
N140:100/0	the write-block bit to select a frequency-rejection level of **7.50 Hz**
N140:100/1	the write-block bit to select a frequency-rejection level of **3.50 Hz**
N140:100/2	the write-block bit to select a frequency-rejection level of **1.00 Hz**
N140:100/3	the write-block bit to select a frequency-rejection level of **0.50 Hz**
N140:100/4	the write-block bit to select a frequency-rejection level of **0.25 Hz**
N140:102/0	the write-block bit to select **"set tare"**
N140:102/1	the write-block bit to select "**zero**"
N140:132/0	the write-block bit to select "**enable calibration mode**"
N140:150	the first word of the status (read) block
N140:150/7	the read-block bit to indicate **"tare successful"**
N140:150/8	the read-block bit to indicate **"zero successful"**
N140:151/1	the read-block bit to indicate **"calibration mode"**
I:000/00	input from selector switch to select a frequency-rejection level of **7.50 Hz**
I:000/01	input from selector switch to select a frequency-rejection level of **3.50 Hz**
I:000/02	input from selector switch to select a frequency-rejection level of **1.00 Hz**
I:000/03	input from selector switch to select a frequency-rejection level of **0.50 Hz**
I:000/04	input from selector switch to select a frequency-rejection level of **0.25 Hz**
I:000/05	input from pushbutton switch to select **"set tare"**
I:000/06	input from pushbutton switch to select **"zero"**
I:000/11	input from pushbutton switch to enable a block-transfer write whenever you want to configure, calibrate, or select a new frequency-rejection level
F141:0	the floating-point gross weight value read from words N140:155 and N140:156 in the status block
F141:1	the floating-point net weight value read from words N140:157 and N140:158 in the status block

Programming the Module

On the pages that follow, we've included both single density and double density examples.

Single Density (Series A) Programming Examples

This section lists and explains ladder logic programming examples for the module when it is configured for single density (Series A) mode.
These are programming *examples*; your ladder logic code may be different.

to see an example of this	refer to this figure	on this page
block transfer write logic	A.1	A–10
copying gross and net weight values to a floating-point file	A.2	A–10
block transfer read logic	A.3	A–10
block transfer error alarms	A.4	A–10
calibration logic	A.5	A–11
taring the module	A.6	A–11
zeroing the module	A.7	A–12
block transfer write permissive logic	A.8	A–13
changing WAVERSAVER logic	A.9	A–14
changing motion tolerance	A.10	A–15
changing zero tolerance	A.11	A–15
alarm points	A.12	A–16

Figure A.1
Block transfer write logic

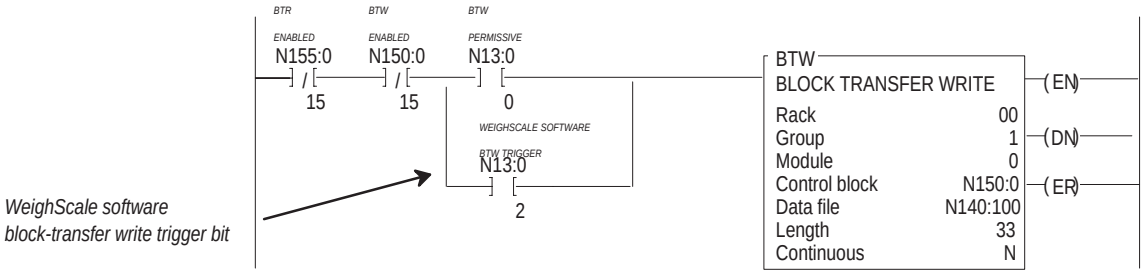


Figure A.2
Copying gross and net weight values to a floating-point file

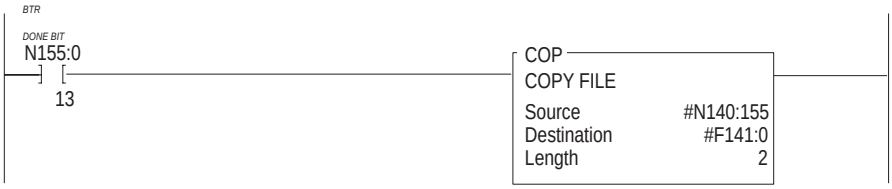


Figure A.3
Block transfer read logic

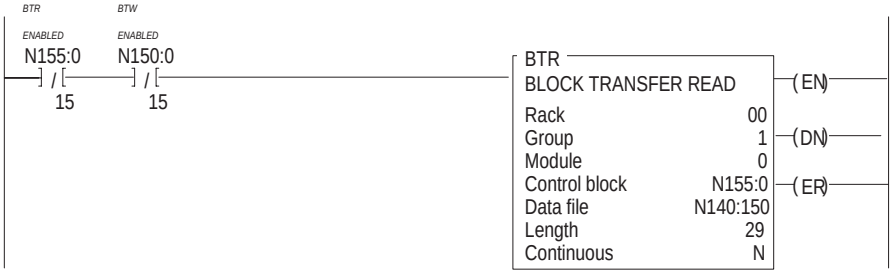


Figure A.4
Block transfer error alarms

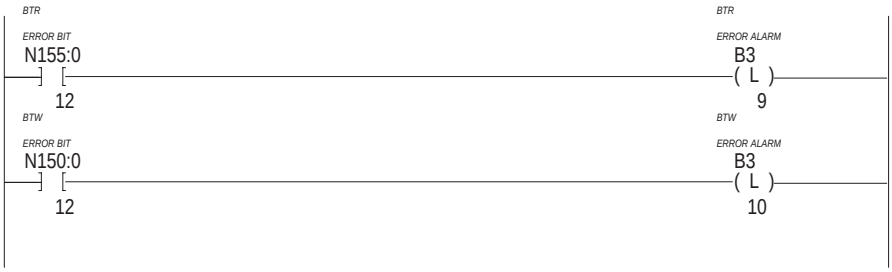


Figure A.5 contains an example of how to start the block-transfer write for calibration or configuration. You can use the block-transfer write trigger bit only for configuration changes, such as WAVERSAVER settings.

Figure A.5
Calibration logic

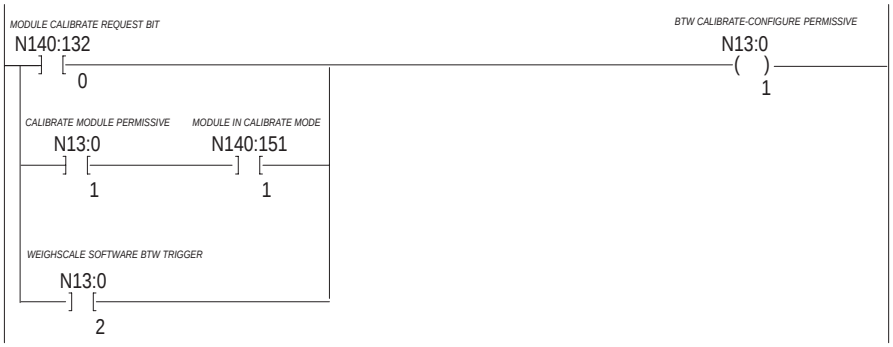
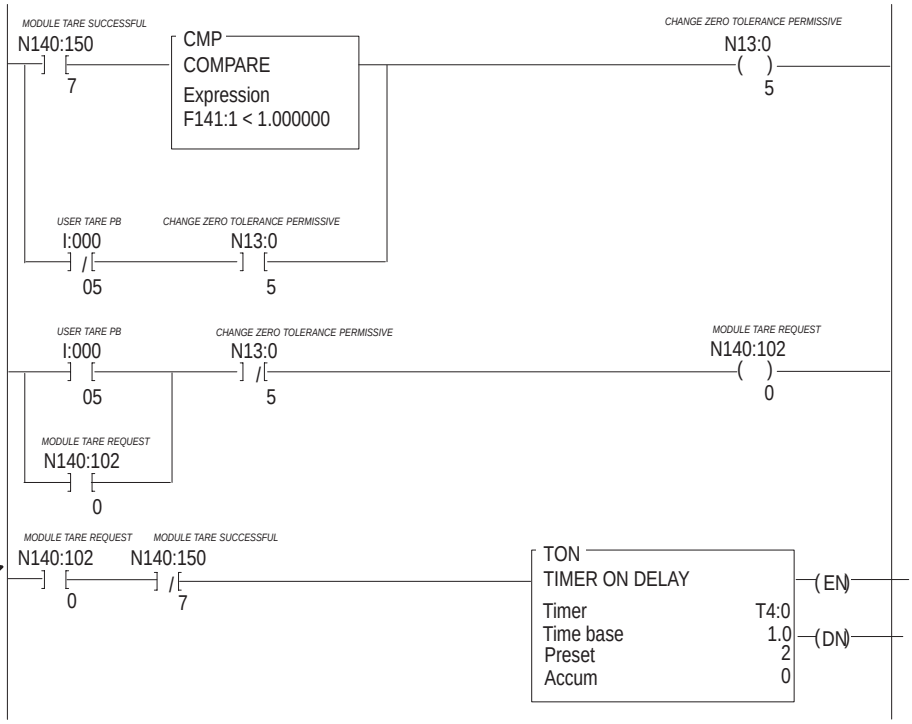
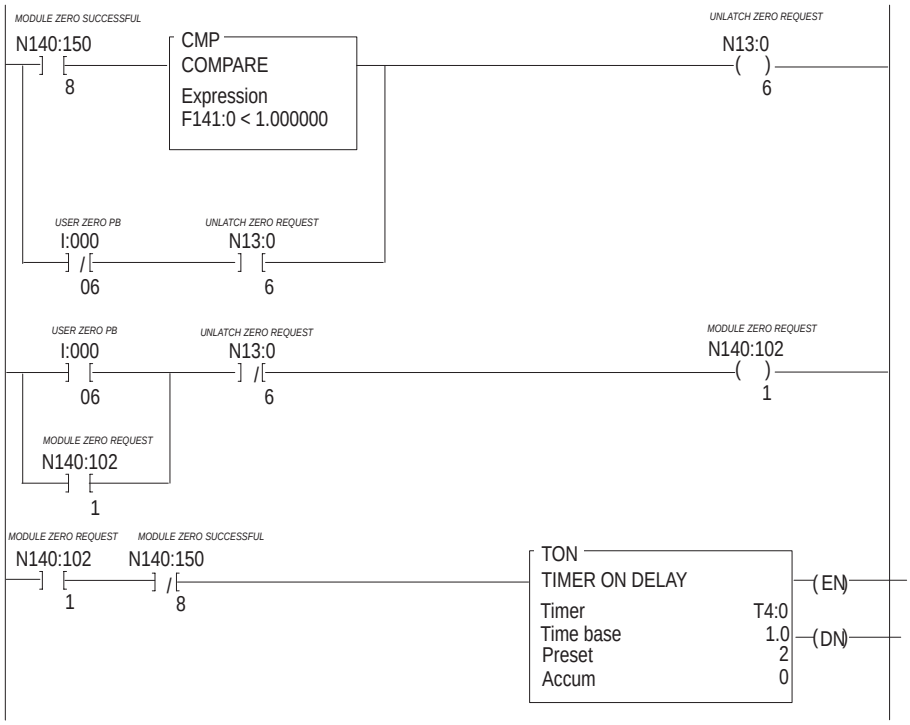


Figure A.6
Taring the module



When a tare is requested, a timer starts. If the TARE SUCCESSFUL bit is not returned in two seconds, the ALARM bit is set.

Figure A.7
Zeroing the module



When a zero is requested, a timer starts. If the ZERO SUCCESSFUL bit is not returned in two seconds, the ALARM bit is set.

Figure A.8
Block transfer write permissive logic

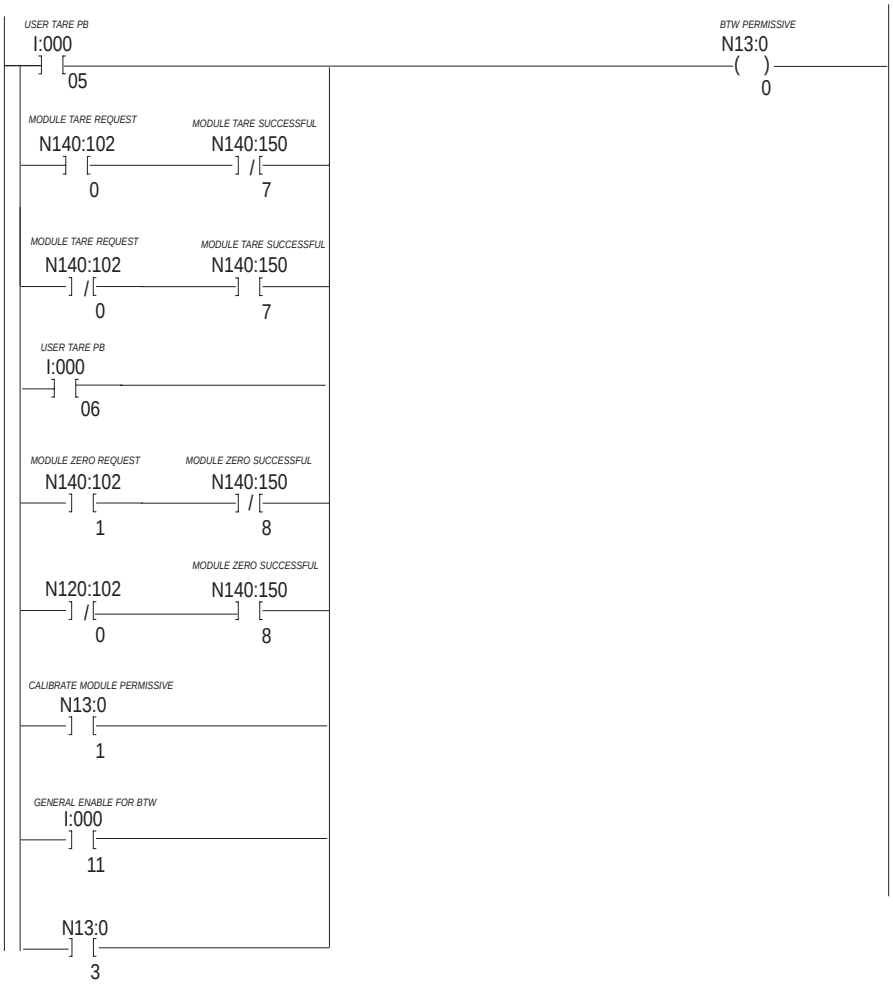


Figure A.9
Changing WAVERSAVER logic

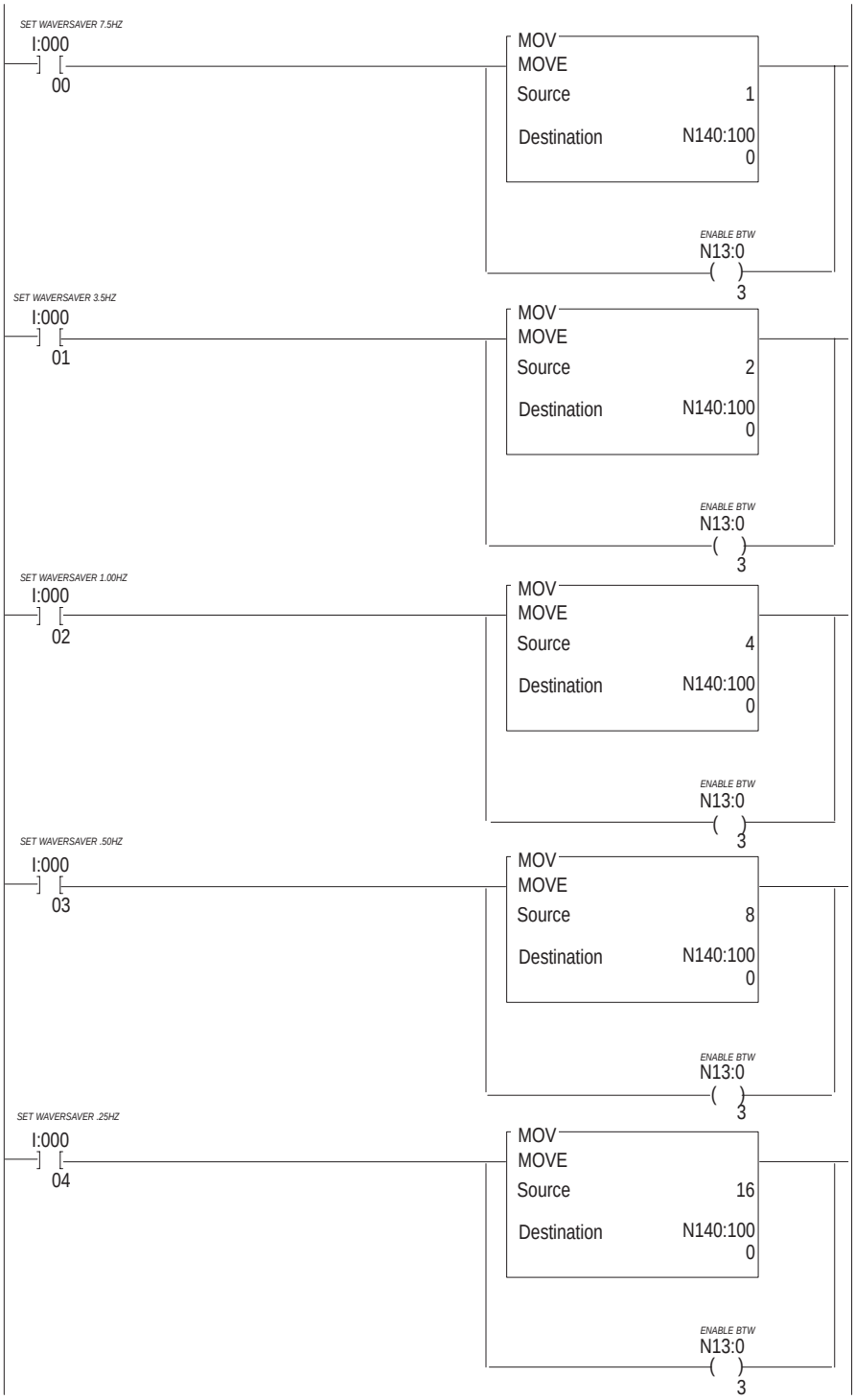


Figure A.10
Changing motion tolerance

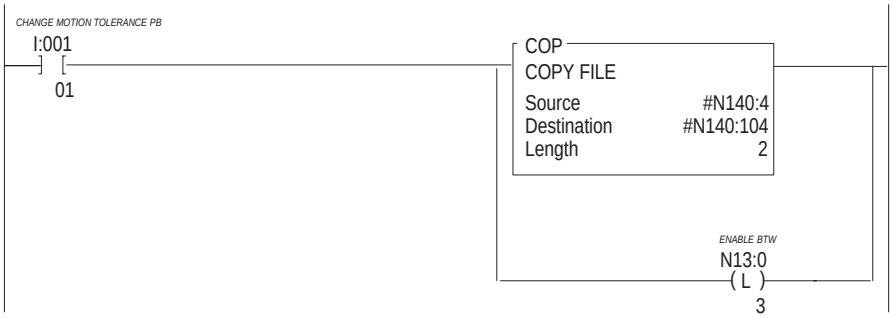


Figure A.11
Changing zero tolerance

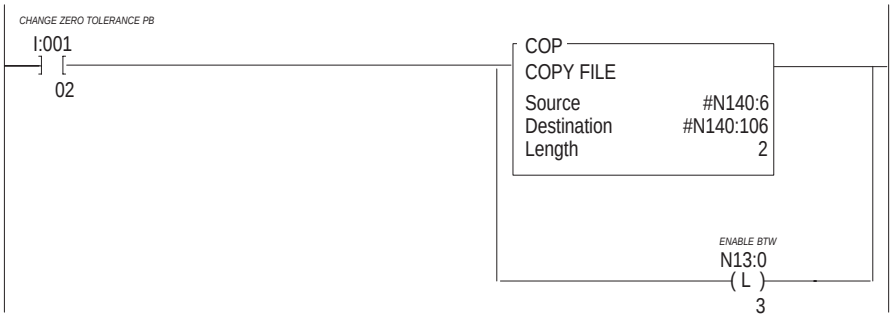
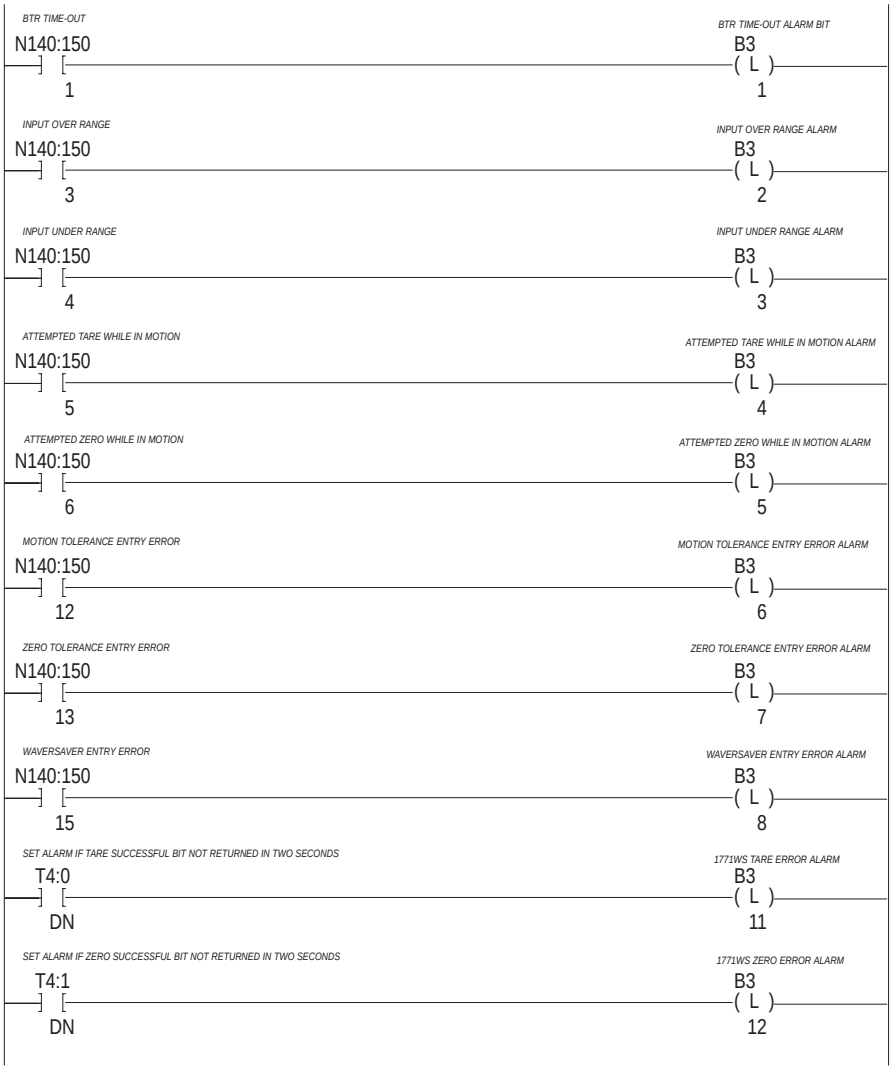


Figure A.12
Alarm points



Double Density Programming Examples

This section lists and explains ladder logic programming examples for the module when it is configured for double density mode. These are programming *examples*; your ladder logic code may be different.

to see an example of this	refer to this figure	on this page
block-transfer write logic	A.13	A–18
copying gross and net weight values to floating-point file	A.14	A–18
block transfer read logic	A.15	A–18
block transfer error alarms	A.16	A–18
calibration logic	A.17	A–19
taring the module	A.18	A–19
zeroing the module	A.19	A–20
block transfer write permissive logic	A.20	A–21
calibration logic	A.21	A–22
changing WAVERSAVER logic	A.22	A–23
verifying WAVERSAVER logic	A.23	A–24
changing motion tolerance	A.24	A–24
verifying motion tolerance	A.25	A–24
changing zero tolerance	A.26	A–24
verifying zero tolerance	A.27	A–25
alarm points	A.28	A–25

Figure A.13
Block transfer write logic

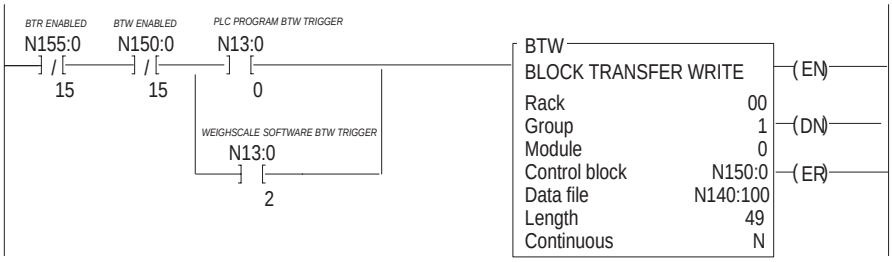


Figure A.14
Copying gross and net weight values to a floating-point file

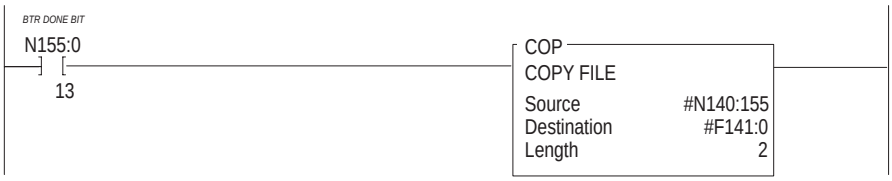


Figure A.15
Block transfer read logic

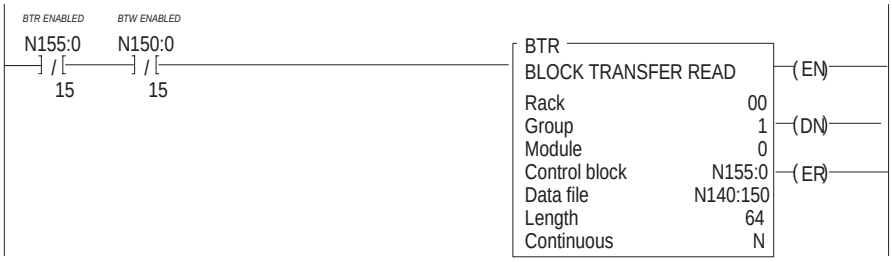


Figure A.16
Block transfer read error alarms

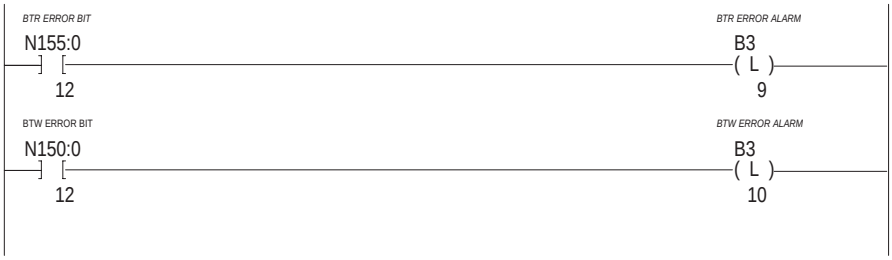


Figure A.17 contains an example of how to start the block-transfer write for calibration or configuration. You can use the block-transfer write trigger bit only for configuration changes, such as WAVERSAVER settings.

Figure A.17
Calibration logic

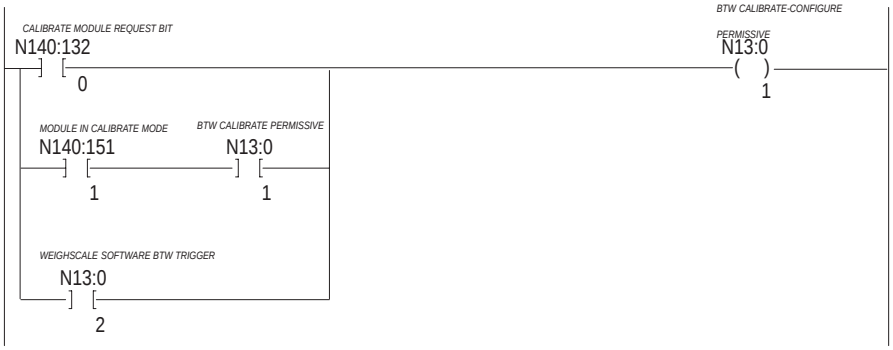
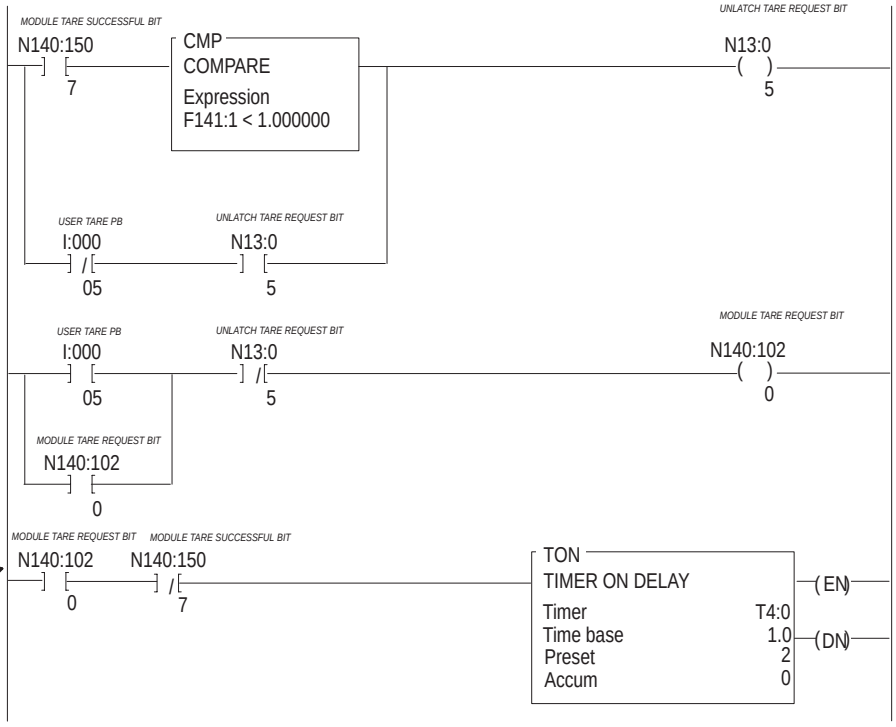
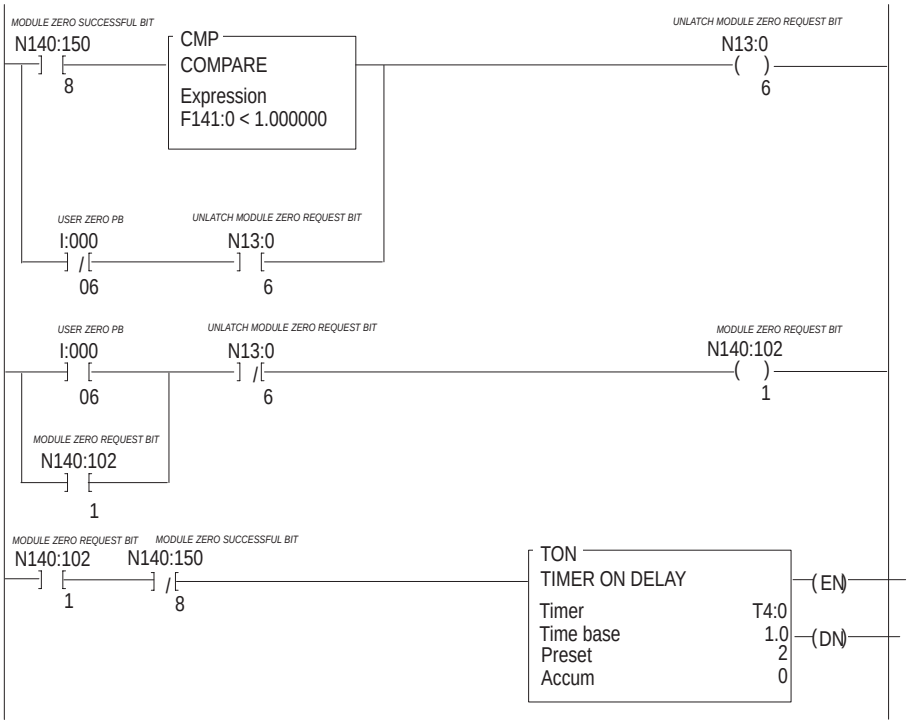


Figure A.18
Taring the module



When a tare is requested, a timer starts. If the TARE SUCCESSFUL bit is not returned in two seconds, the ALARM bit is set.

Figure A.19
Zeroing the module



When a zero is requested, a timer starts. If the ZERO SUCCESSFUL bit is not returned in two seconds, the ALARM bit is set.

Figure A.20
Block transfer write permissive logic

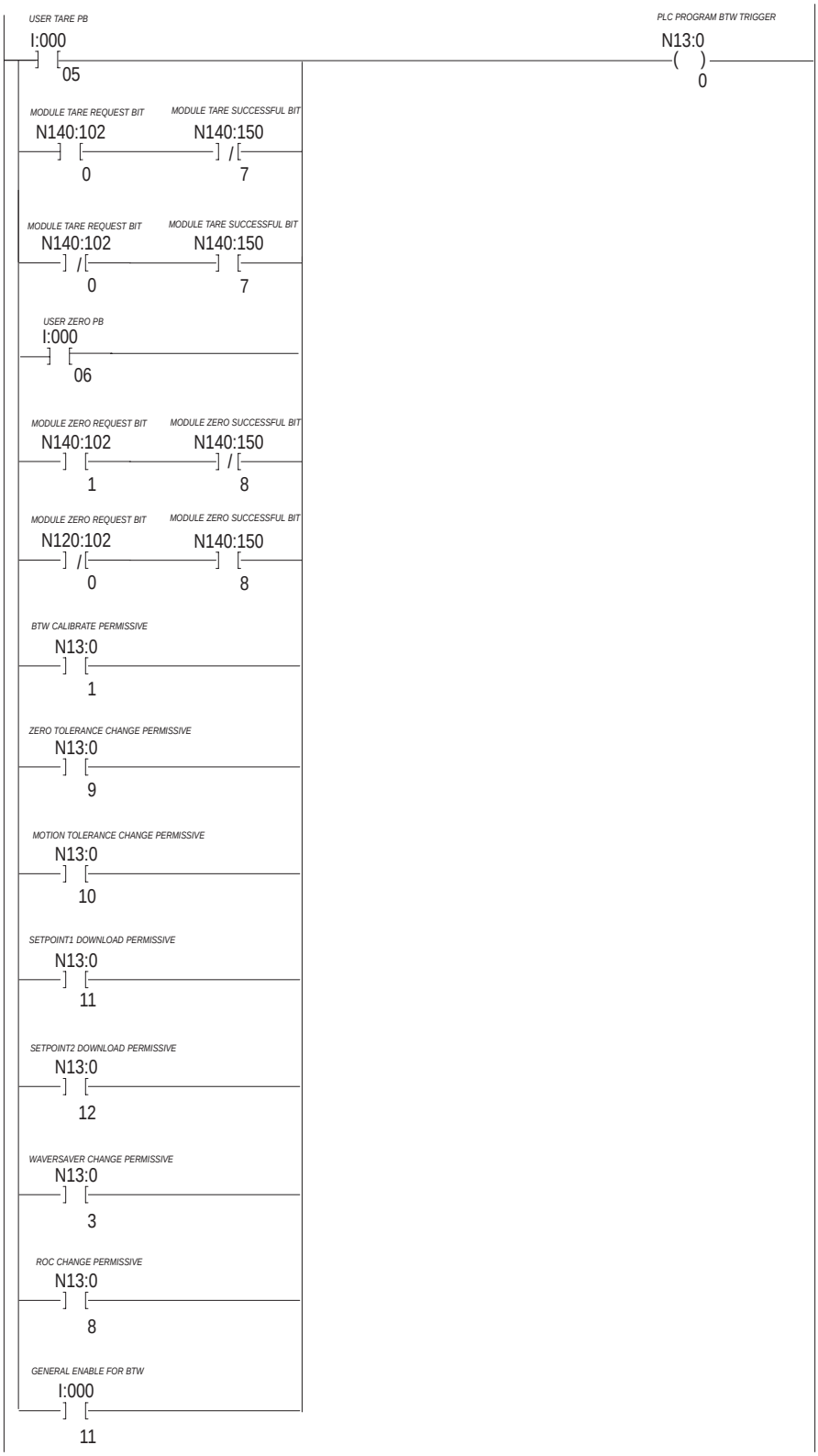


Figure A.21 contains an example of how to start the block transfer write for calibration or configuration. You can use the block transfer write trigger bit only for configuration changes, such as WAVERSAVER settings.

Figure A.21
Calibration logic

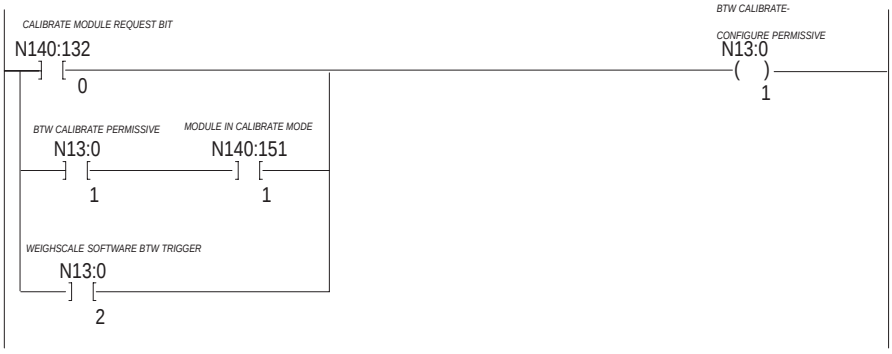


Figure A.22
Changing WAVERSAVER logic

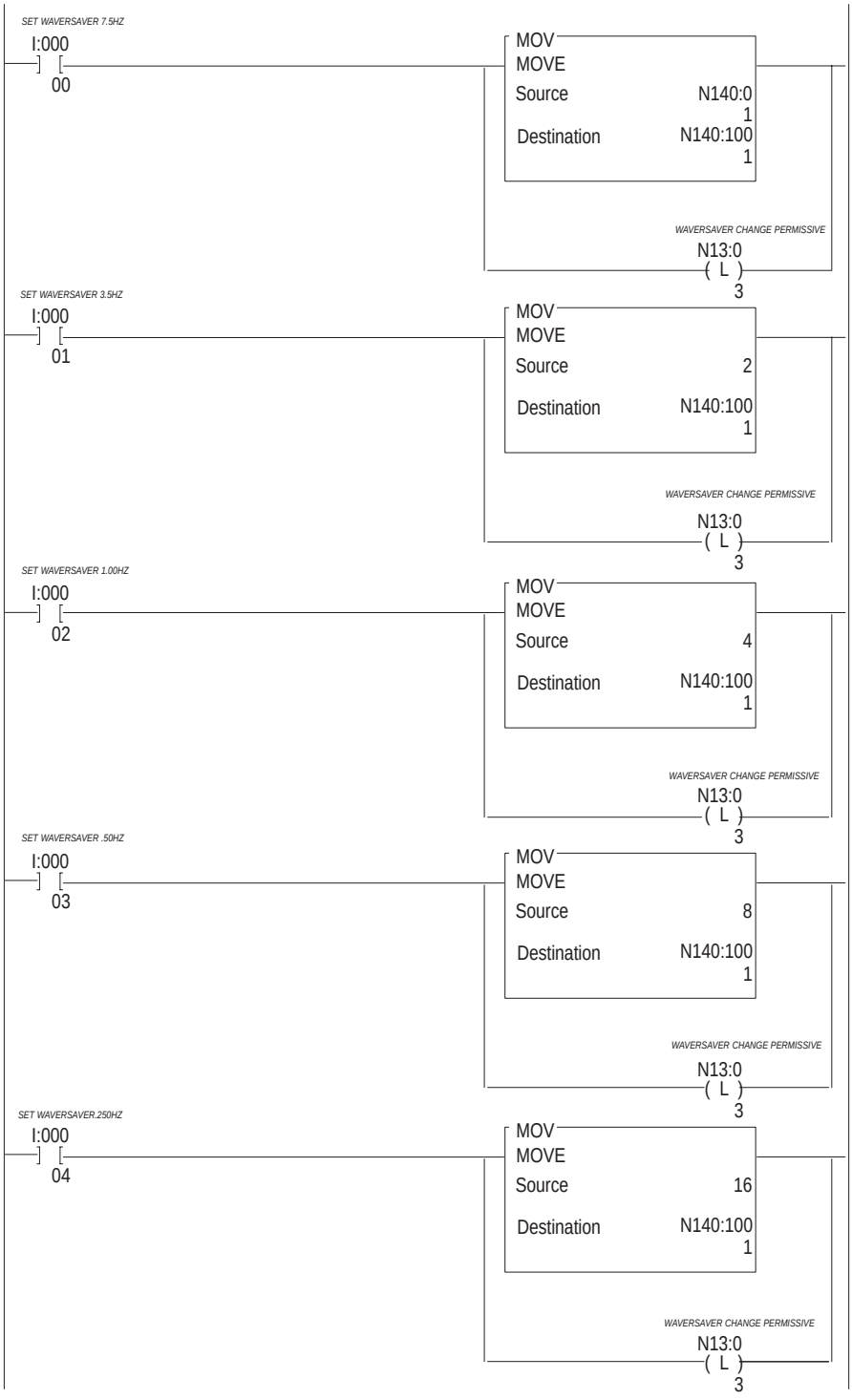


Figure A.23
Verifying WAVERSAVER changes

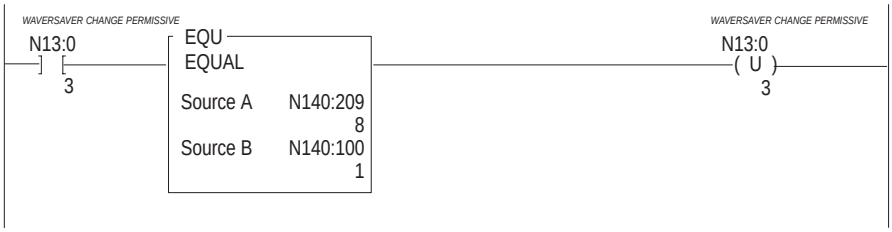


Figure A.24
Changing motion tolerance

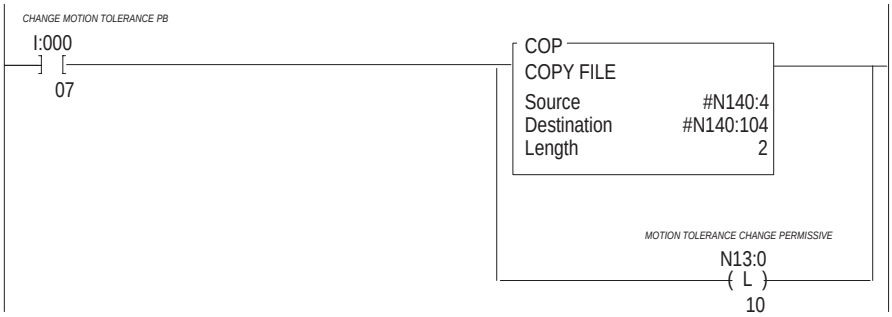


Figure A.25
Verifying motion tolerance changes

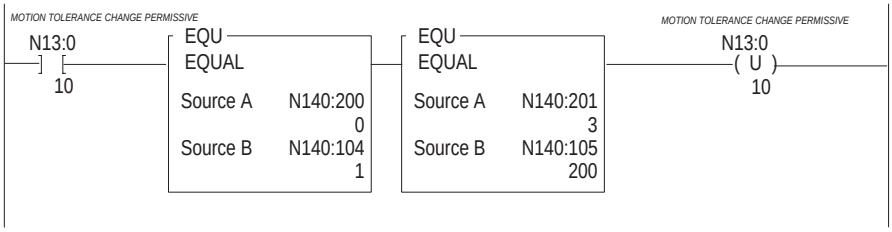


Figure A.26
Changing zero tolerance

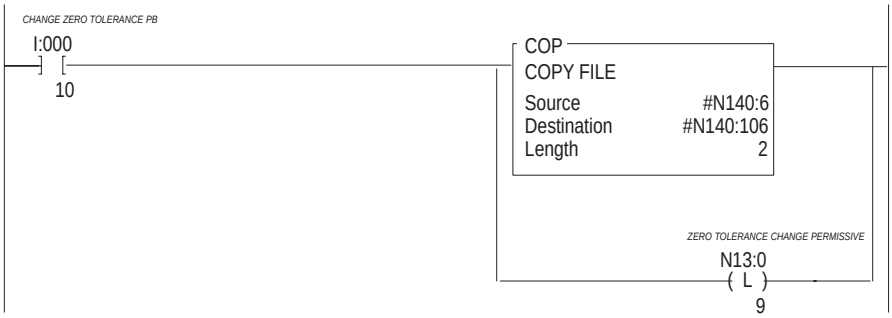


Figure A.27
Verifying zero tolerance changes

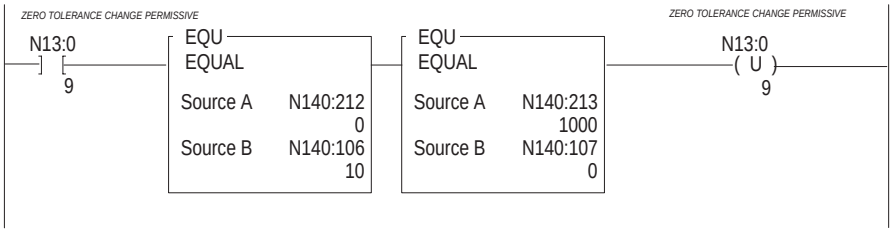


Figure A.28
Alarm points

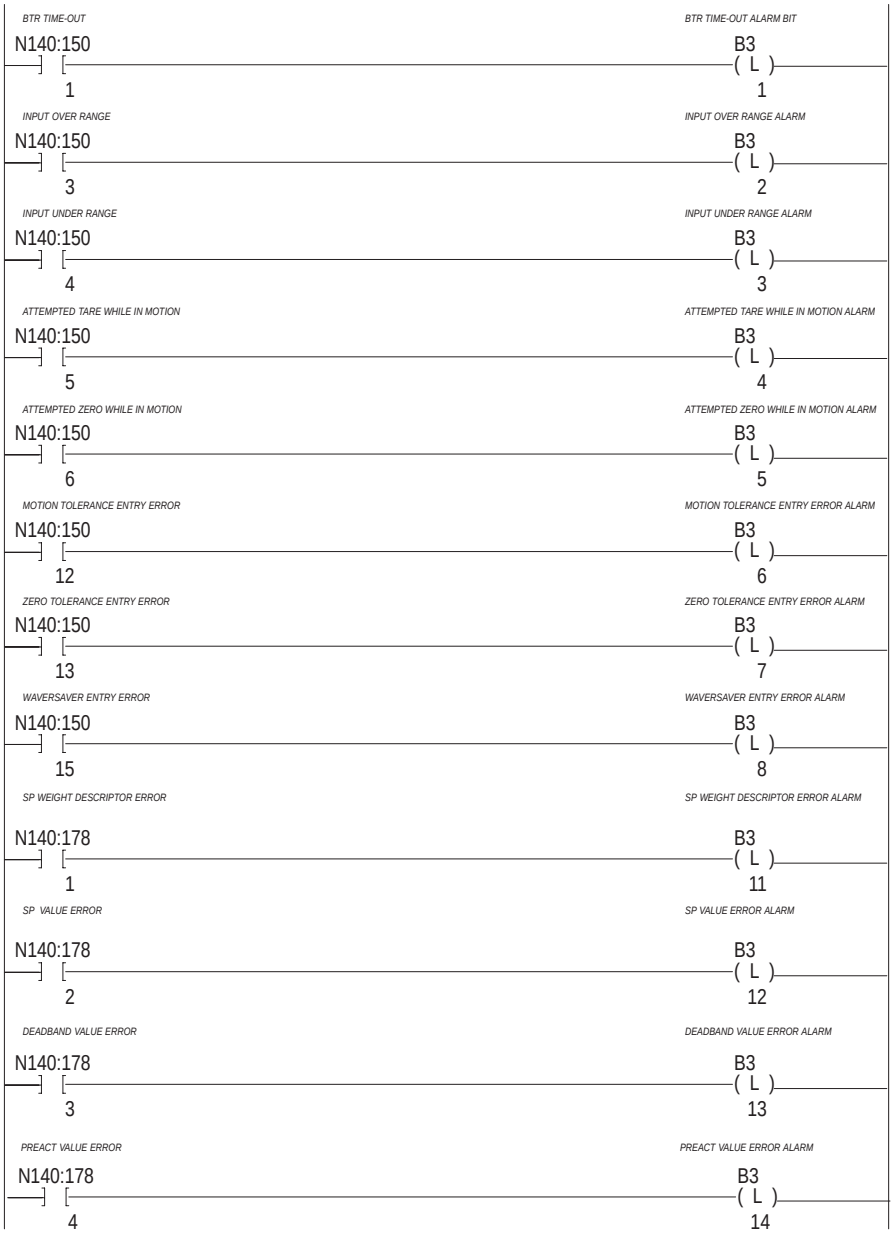
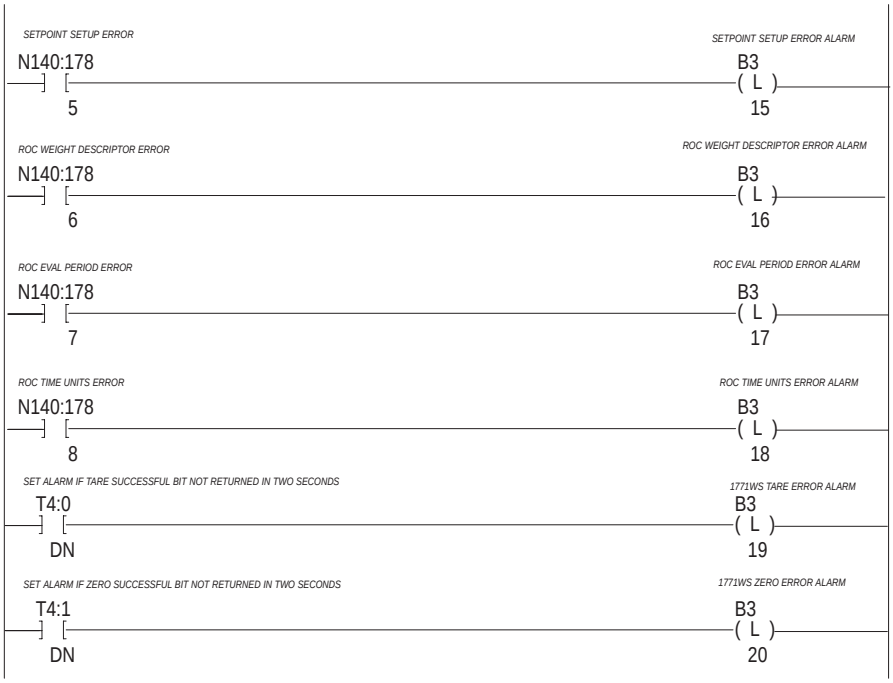


Figure A.29
More alarm points



Reading Floating-point Values

The gross weight and net weight values are available in 32-bit floating-point format in words 5 through 8 of the status block. Since the status block must be in an integer file, each 32-bit floating-point value takes up two 16-bit integer words.

To copy floating-point values into a floating-point file, use a COPY FILE instruction:

This rung unconditionally copies the gross weight from integer words N140:155 and N140:156 into floating-point word F141:0, and copies the net weight from integer words N140:157 and N140:158 into floating-point word F141:1.

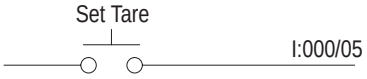
for this value	use
source	the address of the first integer word (containing the 16 most-significant bits of the floating-point value)
destination	the address of the floating-point word
length	indicate the length of the destination block being written to in 32-bit floating-point words To copy the gross and net weight values together, enter a length of 2.

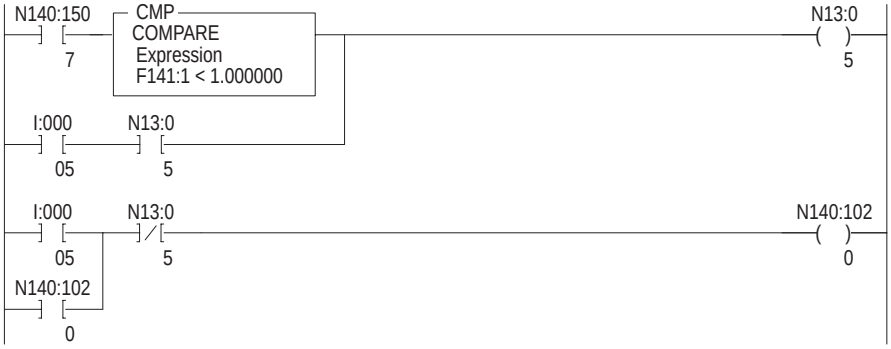
Selecting the Frequency-rejection Value

To illustrate how to select a WAVERSAVER frequency-rejection level, we use a 5-position selector switch and examine each switch position to directly control the corresponding frequency-rejection bit in the write block. To view examples of ladder logic code, refer to Figures A.9—single density (Series A) example— and A.22—double density (Series B) example.

Setting the Tare Value

To illustrate how to set the tare value:



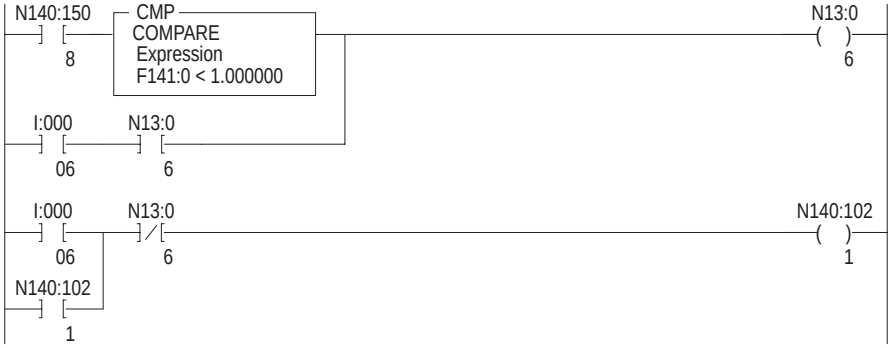


with this rung	
first	when the tare-successful bit (N140:150/7) is turned on and the net weight (F141:1) is less than 1.000000, we turn on bit N13:0/5 until the pushbutton is released
second	we use a pushbutton switch input (I:000/05) to turn on the set-tare bit (N140:102/0) and hold it on through a hold-in path

In your application, you may use other events to trigger a set tare. For example, it may be useful to use the event of the net weight reaching a certain level to trigger a set tare.

Zeroing the Gross Weight

To illustrate how to zero the gross weight:



with this rung	
first	when the zero-successful bit (N140:150/8) is turned on and the gross weight (F141:0) is less than 1.000000, we turn on bit N13:0/6 until the pushbutton is released
second	we use a pushbutton switch input (I:000/06) to turn on the zero bit (N140:102/1) and hold it on through a hold-in path

Creating Setpoints

If you set the module for double density (Series B) mode, it supports two setpoints. Each setpoint is made up of:

- **weight description** — defines the unit of measure for weight in setpoint calculations. Valid values for weight descriptions are:
  - 0 = kilograms
  - 1 = pounds
- **setpoint value** — target weight value. Valid values for setpoint values are -999999 through 999999
- **deadband** — used to separate the "turn-off" weight. At the actual switching point, the deadband prevents switching "chatter." Valid values for deadband values are -999999 through 999999
- **preact value** — accounts for delay in the weighing system due to mechanical delays, material in flight, or other system delays. Valid values for deadband values are -999999 through 999999

Example values are shown below:

Weight Description = pounds
Setpoint = 100 lb.
Preact = -10 lb.
Deadband = -15 lb.

The module sets the comparison result bit to ON when the weight value is ≥ (greater than or equal to) 90 lb., i.e.,

(100 lb. + (-10 lb.)) ≥ 90 lb. (preact)

When the weight value is ≤ (less than or equal to) 85 lb., i.e.,

(100 lb. + (-15 lb.)) ≤ 85 lb. (deadband)

then the module sets the comparison result bit to OFF.
In addition, taring the module, zeroing the module, emptying the vessel, or reducing the weight below the deadband value resets these bits to OFF.

Figures A.30 and A.31 provide additional setpoint examples.

In Figure A.30:

- the comparison result bit will transition to ON when the weight value is $\geq \times 8$ lb., i.e., setpoint + preact, where:

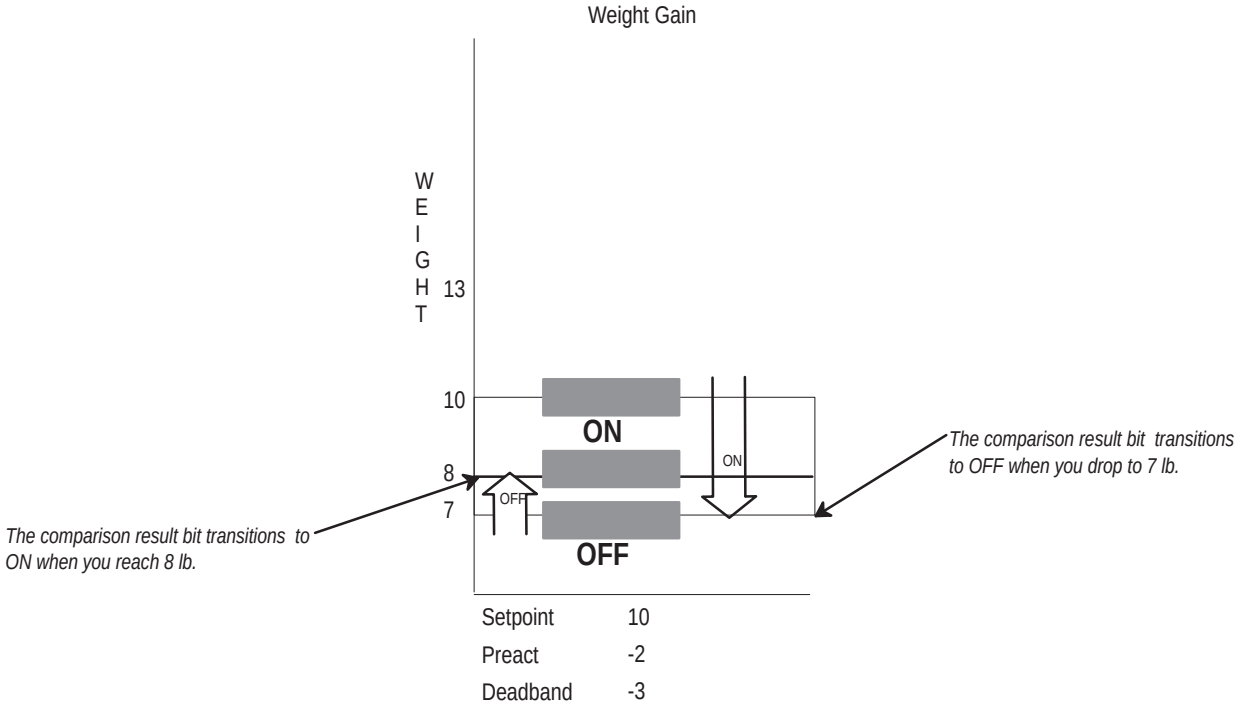
  setpoint = 10 lb.
  preact = -2 lb.

- the comparison result bit will transition to OFF when the weight value is $\leq \times 7$ lb., i.e., setpoint + deadband, where:

  setpoint = 10 lb.
  deadband= -3 lb.

When the weight value reaches 8 lb., the comparison result bit is turned ON. (If you have established alarms to notify you when the weight value reaches this value, they will sound at this point.) The comparison result bit will remain ON until the weight value drops to 7 lb.

Figure A.30
Setpoint Example – Weight Gain



In Figure A.31:

- the comparison result bit will transition to ON when the weight value is ≥ ×-8 lb., i.e., setpoint + preact, where:

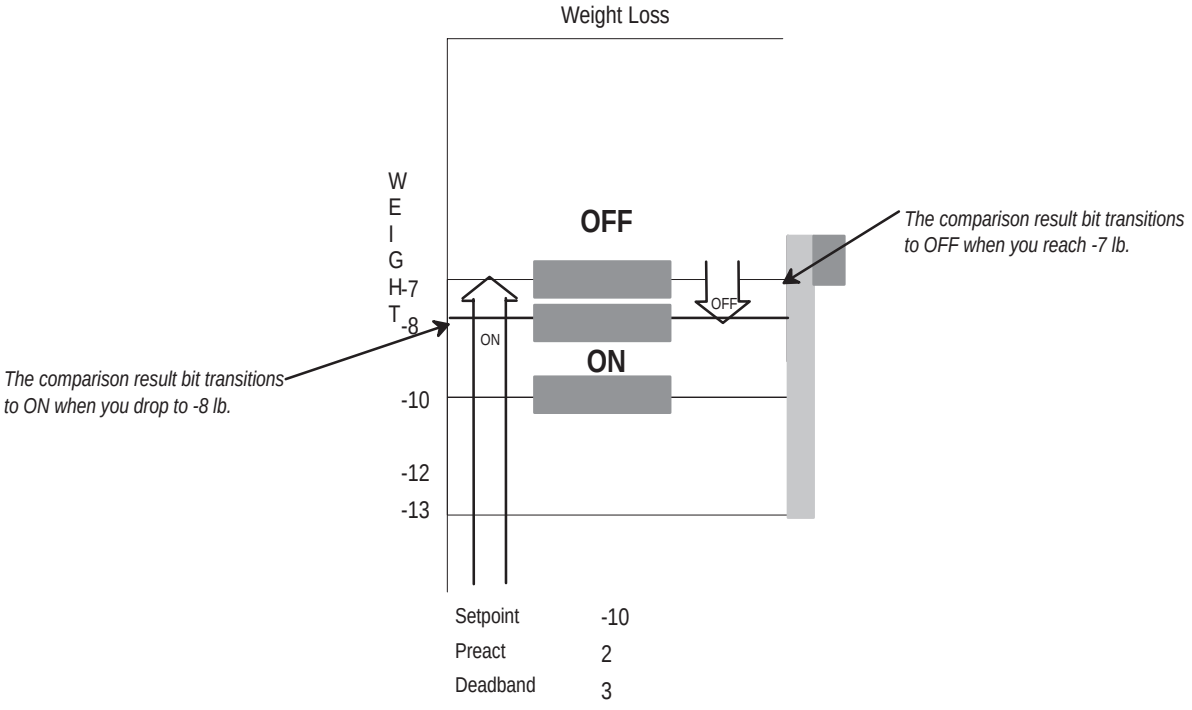
  setpoint = -10 lb.
  preact = 2 lb.

- the comparison result bit will transition to OFF when the weight value is ≤ ×-7 lb., i.e., setpoint + deadband, where:

  setpoint = -10 lb.
  deadband= 3 lb.

When the weight value drops to -8 lb., the comparison result bit turns ON. (If you have established alarms to notify you when the weight value reaches this value, they will sound at this point.) The comparison result bit will remain ON until the weight value reaches -7 lb.

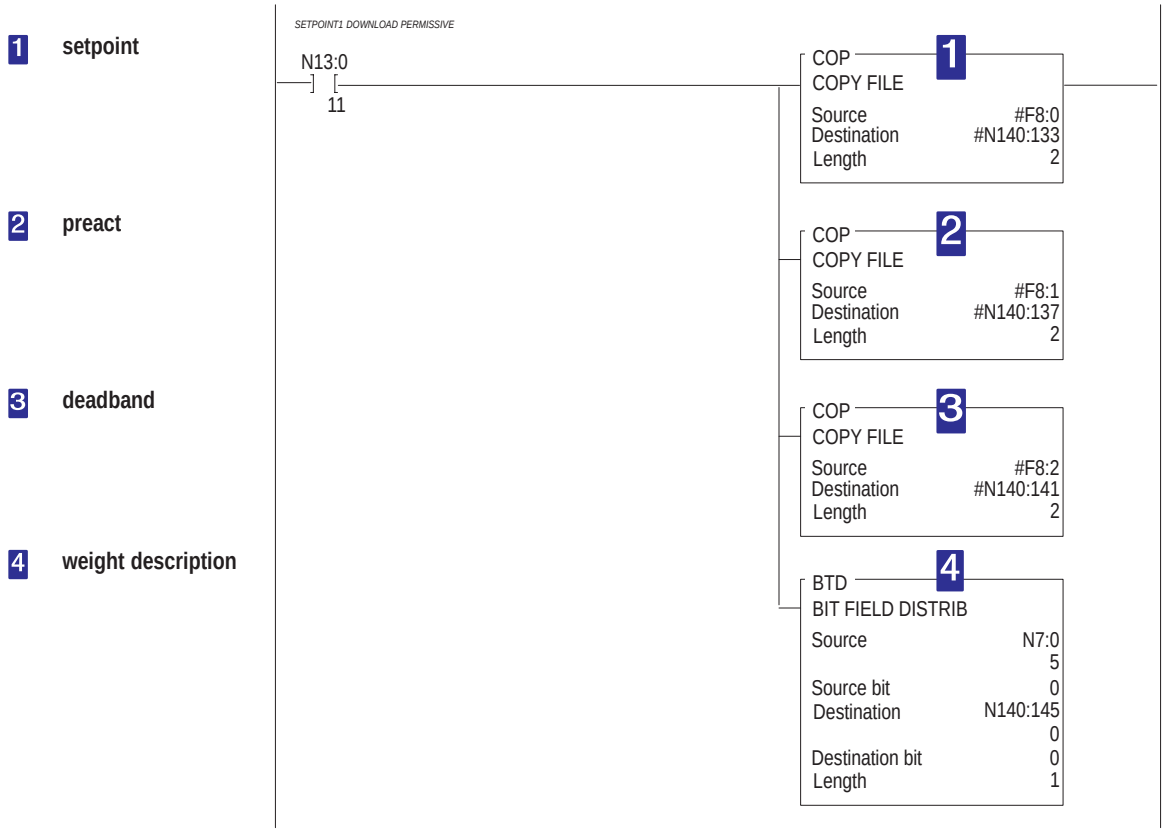
Figure A.31
Setpoint Example – Weight Loss



The figures that follow provide examples of how you can create setpoints.

In Figure A.32, we place setpoint parameters in a floating-point file and copy the parameters to the module's block transfer write data block.

Figure A.32
Copying setpoints to block transfer write data block



In Figure A.33, to verify that the module has the new setpoints, we copy the module's setpoints from the block-transfer read data block to a floating-point file. The setpoints are then compared with setpoints in the recipe.

Figure A.33
Verifying the module has new setpoints

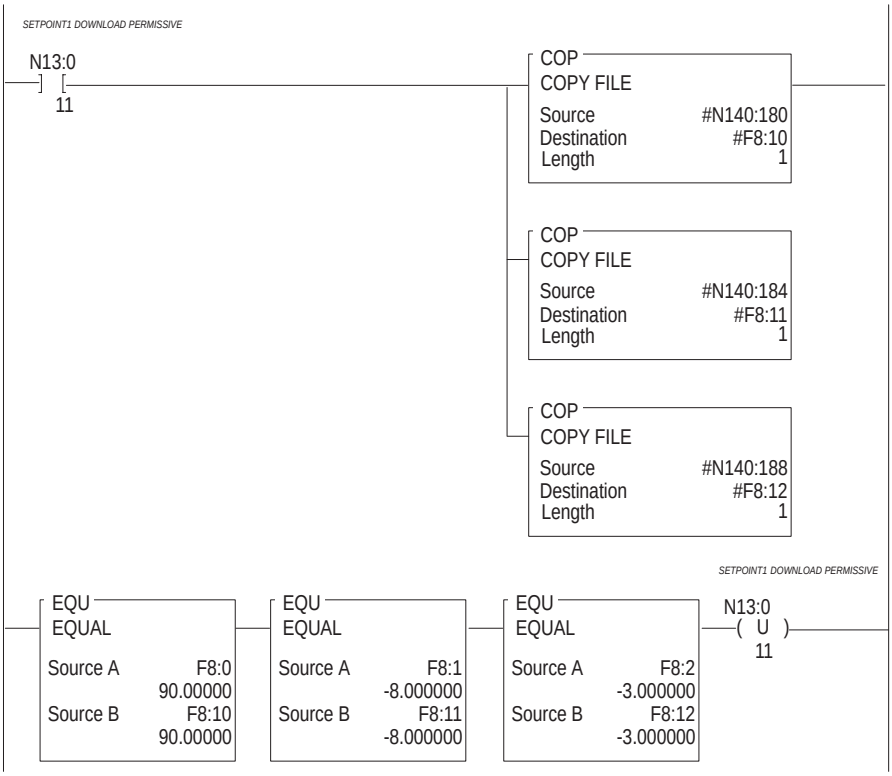
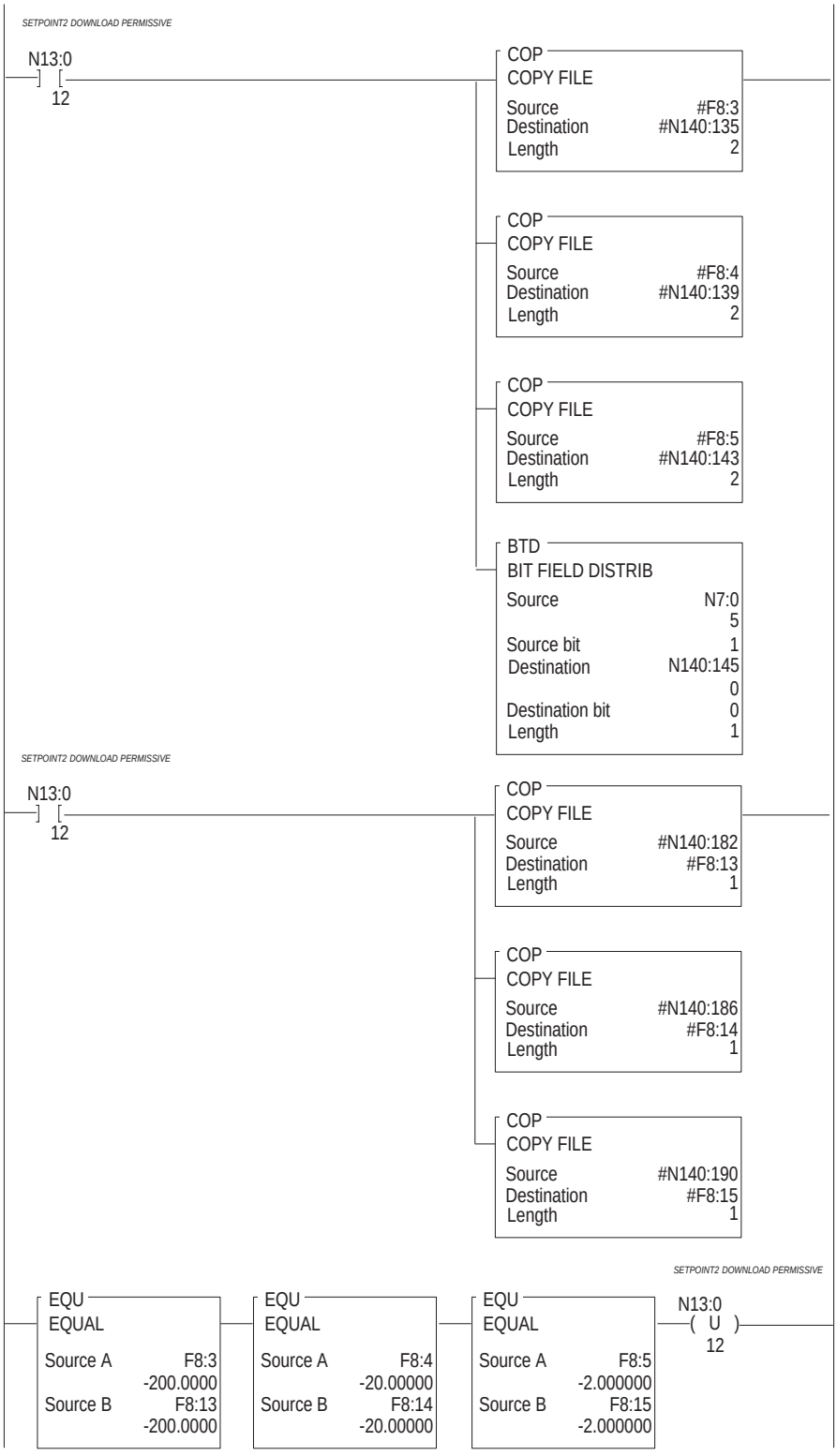
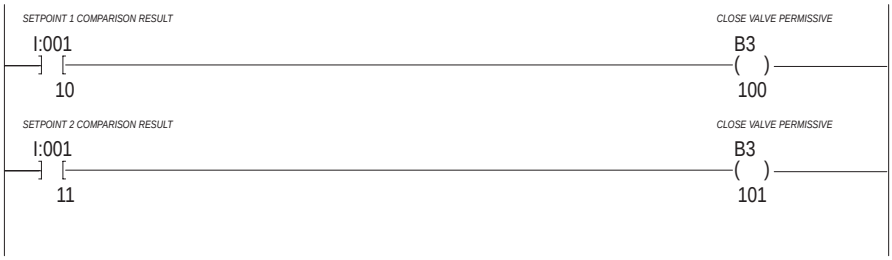


Figure A.34
Setpoint2 logic



In Figure A.35, the comparison result bits are single transferred to bits 10 and 11 (octal) to the input image word that corresponds to the module's physical location in the chassis. When the weight value is ≧ to the sum of (setpoint1 + preact1), then bit 10 is set to ON. Bit 11 is set to ON when the weight value ≧ to the sum of (setpoint2 + preact2). These bits are set to OFF when the weight value is < (setpoint + preact); for example, when we tare or zero the scale.

Figure A.35
Using comparison result bits



Configuring Rate-of-change

The rate-of-change represents the rate-of-change in weight as measured by the module. This calculation is based on three parameters:

- **weight description**—defines the unit of measure for weight in rate-of-change calculations. Valid values for weight descriptions are:
  - 0 = kilograms
  - 1 = pounds
- **time units**—unit of measure for time in rate-of-change calculations. Valid values for time units are:
  - 0 = seconds
  - 1 = minutes
  - 2 = hours
- **evaluation period**—the time over which a rate-of-change calculations are made. Valid values for evaluation periods are 1 millisecond-32.767 seconds

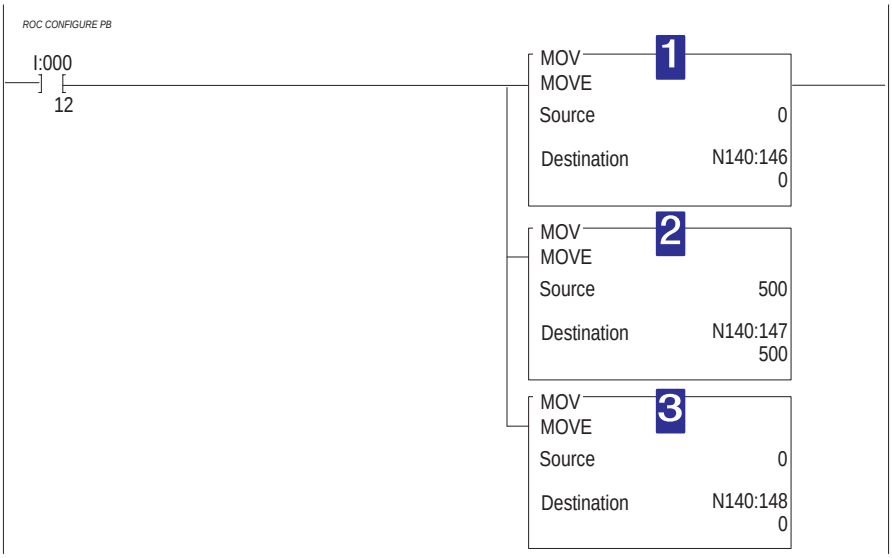
The figures that follow provide examples of how you can specify a rate-of-change value.

Figure A.36
Configuring rate-of-change

1 **time units –**
0=seconds
1=minutes
2=hours

2 **evaluation period –**
1 millisecond to
32.767 seconds

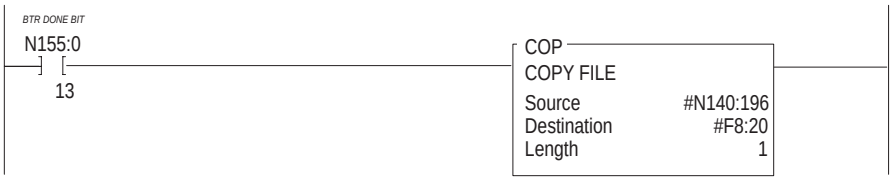
3 **weight description –**
0=kg.
1=lb.



Rate-of-change parameters

To write the rate-of-change parameters to the module, you must initiate a block-transfer write.

Figure A.37
Copying rate-of-change value to floating-point file to display



Saving Configuration Changes

Configuration changes that are made when the module is not in calibration mode are saved to non-volatile memory when the save flag in the block transfer is set. If this flag is not set, the values reside in volatile, run-time memory until you reset or power up the module. At this time, the values are initialized to their previously stored values. To set the save flag, you must edit your ladder logic code.

Verifying Configuration Data

If you have configured the module for double density mode, the module returns configuration parameters in the block transfer read data block. To configure the module for double density mode, see Chapter 2 of this manual. Words 48-63 store the configuration parameter values. For a complete list of the block-transfer read data block, see Appendix C of this manual.

Editing the Configuration/Calibration Block

This appendix shows you how to calibrate the module by directly manipulating the configuration/calibration block in the data table rather that using the WeighScale software as described in Chapter 8, “Configuring the Module.” This appendix contains these sections:

Words 33 – 48 are shaded gray in this table to indicate that these words apply to double-density (Series B) mode only.

Performing a Hard Calibration

To perform a hard calibration by editing the configuration block, you must:

- enter the configuration values for the appropriate words in the configuration/calibration block, then
- perform the hard calibration

Enter Values in the Block

Before performing a hard calibration, enter the appropriate values for these words in the configuration/calibration block:

word	description
0	WAVERSAVER setting
1	weight units & auto-zero status
3	decimal-point location
4	motion tolerance (MSW)
5	motion tolerance (LSW)
6	zero tolerance (MSW)
7	zero tolerance (LSW)
8	number of samples used for averaging (1—200)
9	real-time sample period (50—10,000ms)
14	calibration low weight (MSW)
15	calibration low weight (LSW)
16	calibration mid weight (MSW)
17	calibration mid weight (LSW)
18	calibration high weight (MSW)
19	calibration high weight (LSW)
26	calibration year (xxxx)
27	calibration month (0—12)
28	calibration day
29	calibration identification (MSW)
30	calibration identification (LSW)

Configuration/calibration block

For more on these configuration/calibration block words, refer to page B–9.

Perform the Hard Calibration

To perform a hard calibration:

1. To place the module in calibration mode, in write-block word 32, set bit 0 to **1**.

   In read-block word 1, bit 1 is set to **1** to indicate the calibration mode. If the module has not previously been calibrated, in read-block word 1, bit 0 is set to **1**.

2. Perform a CAL-LO:

   A. Place the calibration low weight value in words 14 and 15. Be sure to observe the correct decimal point location. (CAL–LO read)

   B. With the low calibration weight (or no weight) on the scale, in write-block word 32, set bit 4 to **1**.

   If no errors occur, in approximately 12 seconds, read-block word 2, bit 8 is set to **1**. (CAL-LO successful)

   C. In write-block word 32, reset bit 4 to **0**.

3. Optionally, perform a MID-LIN:

   A. Place the calibration low weight value in words 16 and 17. Be sure to observe the correct decimal point location.

   B. With the midpoint linearization calibration weight on the scale, in write-block word 32, set bit 5 to **1**.

   If no errors occur, in approximately 12 seconds, in read-block word 2, bit 9 is set to **1**. (MID-LIN successful)

   C. In write-block word 32, reset bit 5 to **0**.

4. Perform a CAL-HI:

   A. Place the calibration high weight value in words 18 and 19. Be sure to observe the correct decimal point location.

   B. With the high calibration weight on the scale, in write-block word 32, set bit 6 to **1**.

   If no errors occur, in approximately 12 seconds, in read-block word 2, bit 10 is set to **1**. (CAL-HI successful)

   C. In write-block word 32, reset bit 6 to **0**.

5. Accept the calibration data:

   A. In write-block word 32, set bit 7 to **1**.

   If no errors occur, in read-block word 1, bit 4 is set to **1**. (The write is successful.)

   B. In write-block word 32, reset bit 7 to **0**.

6. To exit calibration mode, in write-block word 32, reset bit 0 to **0**.

   In read-block word 1, bit 1 is set to **0**.

Performing a Soft Calibration

To perform a soft calibration by editing the configuration/calibration block, you must:

- enter the appropriate values for these words in the configuration/calibration block
- perform the soft calibration

Enter Values in the Block

Before performing a soft calibration, enter the appropriate values for these words in the configuration/calibration block:

word	description
0	WAVERSAVER setting
1	weight units & auto-zero status
3	decimal-point location
4	motion tolerance (MSW)
5	motion tolerance (LSW)
6	zero tolerance (MSW)
7	zero tolerance (LSW)
8	number of samples used for averaging (1—200)
9	real-time sample period (50—10,000ms)
10	system sensitivity (MSW)[1]
11	system sensitivity (LSW)[1]
12	range (MSW)
13	range (LSW)
14	calibration low weight (MSW)
15	calibration low weight (LSW)
26	calibration year (xxxx)
27	calibration month (0—12)
28	calibration day
29	calibration identification (MSW)
30	calibration identification (LSW)

[1] System sensitivity is a value derived from the sensitivity and output resistance of all the load cells in the system.

Configuration/calibration block

For more on these configuration/calibration block words, refer to page B–9.

Perform the Soft Calibration

To perform a soft calibration:

1. To place the module in calibration mode, in write-block word 32, set bit 0 and bit 2 to **1**.

   In read-block word 1, bit 1 and bit 5 are set to **1**. If the module has not previously been calibrated, in read-block word 1, bit 0 is set to **1**.

2. Perform a CAL-LO:

   A. With the low calibration weight (or no weight) on the scale, in write-block word 32, set bit 4 to **1**.

   If no errors occur, in approximately 12 seconds, read-block word 2, bit 8 is set to **1**. (CAL-LO successful)

   B. In write-block word 32, reset bit 4 to **0**.

3. Accept the calibration data:

   A. In write-block word 32, set bit 7 to **1**.

   If no errors occur, in read-block word 1, bit 4 is set to **1**. (write successful)

   B. In write-block word 32, reset bit 7 to **0**.

4. To exit calibration mode, in write-block word 32, reset bit 0 to **0**.

   In read-block word 1, bit 1 and bit 5 are set to **0**.

Performing a C2 Calibration

To perform a C2 calibration by editing the configuration/calibration block, you must:

- enter the appropriate values for these words in the configuration/calibration block
- perform the C2 calibration

Enter Values in the Block

Before performing a C2 calibration, enter the appropriate values for these words in the configuration/calibration block:

word	description
0	WAVERSAVER setting
1	weight units & auto-zero status
3	decimal-point location
4	motion tolerance (MSW)
5	motion tolerance (LSW)
6	zero tolerance (MSW)
7	zero tolerance (LSW)
8	number of samples used for averaging (1—200)
9	real-time sample period (50—10,000ms)
14	calibration low weight (MSW)
15	calibration low weight (LSW)
26	calibration year (xxxx)
27	calibration month (0—12)
28	calibration day
29	calibration identification (MSW)
30	calibration identification (LSW)
31	number of load points

Configuration/calibration block

For more on these configuration/calibration block words, refer to page B–9.

Perform the C2 Calibration

To perform a C2 calibration:

1. To place the module in calibration mode, in write-block word 32, set bit 0, bit 2, bit 3, and bit 8 to **1**.

   In read-block word 1, bits 1, 5, and 6 are set to **1**. If the module has not previously been calibrated, in read-block word 1, bit 0 is set to **1**. If no errors occur, in approximately 12 seconds, read-block word 1, bit 12 is set to **1**. (C2-Cal read complete)

2. Perform a CAL-LO:

   A. With the low calibration weight (or no weight) on the scale, in write-block word 32, set bit 4 to **1**.

   If no errors occur, in approximately 12 seconds, read-block word 2, bit 8 is set to **1**. (CAL-LO successful)

   B. In write-block word 32, reset bit 4 to **0**.

3. Accept the calibration data:

   A. In write-block word 32, set bit 7 to **1**.

   If no errors occur, in read-block word 1, bit 4 is set to **1**. (write successful)

   B. In write-block word 32, reset bit 7 to **0**.

4. To exit calibration mode, in write-block word 32, reset bit 0 to **0**.

   In read-block word 1, bit 1 and bit 5 are set to **0**.

Restoring the Module

After you have calibrated the module, you must copy the voltage values in the read block words 20, 21, 22, 23, 24, and 25 into the write block words 20, 21, 22, 23, 24, and 25.

Note that the values in the read block are not in the same order as those in the write block. If these values are not in the write block, the restore function does not work. All of these parameters must have valid values before the restore function can be completed.

- low weight
- mid weight
- high weight
- low volts
- mid volts
- high volts
- cal year
- cal month
- cal day
- cal ID first byte
- cal ID next bite

To restore the module:

1. To place the module in calibration mode, in write-block word 32, set bit 0 to **1**.
2. Wait for the module to enter calibration mode (read block word 1, bit 1 is set to **1**, and the Cal/Com LED flashes red).
3. Set bit 1 (the restore bit) to **1**.

   In read-block word 1, bit 1 is set to **1**. If the module has not previously been calibrated, in read-block word 1, bit 0 is set to **1**. When the restore is complete, in read-block word 1, bit 14 is set to **1** (restore data complete).
4. In write block word 32, set bit 7 to **1**.
5. Wait for read block word 1, bit 4 to be set to **0**.
6. To exit calibration mode, in write-block word 32, reset bit 0, bit 1, and bit 7 to **0**.

   In read-block word 1, bit 1 and bit 14 are set to **0**.

Saving the Tare and Zero Values in Non-volatile Memory

By default, the WeighScale module typically stores the tare and zero values in internal memory. These values are not included in read or write block transfer data, so they are not stored in the PLC processor data table. This means that any time the module loses power, the tare and zero values are reset. You must repeat the tare and zero functions to restore the tare and zero values in use before power to the module was lost.

To avoid having to repeat the tare and zero functions, you can store the current tare and zero values in non-volatile memory. These values are restored automatically when power is restored to the module.

To store tare and zero values in non-volatile memory:

1. In write block word 32, set bit 7 (accept data) to **1**.
2. Wait until the module sets read block word 1, bit 2 (write successful) to **1**.
3. In write block word 32, reset bit 7 to **0**.

Configuration/Calibration Block

The configuration/calibration block contains 33 words as follows:

Terminology

If you need definitions of the Weigh Scale Module terms used in this chapter, see the Glossary at the end of this manual.

Series B only

Words shaded in gray in this table indicate that these words apply to double density (Series B) mode only.

word	bits	description
N140:100		**WAVERSAVER Selection** — Use one of these bits to select the lowest frequency to reject. Only changes of weight at frequencies below this value is reflected in the input value passed on in the status block as the weight value. This frequency-rejection action eliminates process noise and causes a more stable weight reading. These selections are mutually exclusive. If you turn on more than one bit, the WAVERSAVER selection error is reported in bit 15 of word 0 in the status block.
	0	•1 = Reject all frequencies of **7.50 Hz** and above.
	1	•1 = Reject all frequencies of **3.50 Hz** and above.
	2	•1 = Reject all frequencies of **1.00 Hz** and above.
	3	•1 = Reject all frequencies of **0.50 Hz** and above. (Default selection.)
	4	•1 = Reject all frequencies of **0.25 Hz** and above.

word	bits	description
1		**Weight Modes** — These are modes that can be changed at any time. If you save the data to non-volatile memory, these mode selections are saved.
	0	**Unit of Weight (Lb/Kg)** — Set this bit to reflect the units of the calibration weight at the time of calibration. •0 = The weight unit is **Kg**. •1 = The weight unit is **Lb**. (Default selection.)
	1	**Auto-Zero** — With auto-zero enabled, whenever the weight on the scale (the absolute value of the zero offset from the calibration zero point) is within zero tolerance and the scale is not in motion for **1s + (***#samples* **+ 1)(0.05s)**, the gross weight is set to zero. Where *#samples* is the number of weight samples used to calculate the average current weight. You enter the *#samples* value in word 8. You enter the motion-tolerance value in words 4 and 5. You enter the zero-tolerance value in words 6 and 7. •0 = Auto-Zero **disabled**. (Default selection.) •1 = Auto-Zero **enabled**.
2		**Weight Functions** — Use these functions to modify the module reference points.
	0	**Set Tare** — If this bit is **on** while the scale is in motion, the ***"attempt to set tare while in motion"*** error bit is turned on. •0 = Leave the tare value unchanged. •1 = If the scale is not in motion, continually set the tare value equal to the gross weight, resulting in a zero value for the net weight.
	1	**Zero** — If this bit is **on** while the scale is in motion, the ***"attempt to zero while in motion"*** error bit is turned on. •0 = Leave the gross weight value unchanged. •1 = If the scale is not in motion and the gross weight (the absolute value of the zero offset from the calibration zero point) is within zero tolerance, continually set the gross weight value to zero.
N140:103	0–15	**Decimal-Point Location** — Enter this value to set the number of digits to the right of the decimal point for all weight integer values. (0 through 6)
4	0–15	**Motion Tolerance (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the weight change that will trigger the in-motion flag to be set. The weight change is measured as the difference between the current average weight value and the average weight value sampled one second earlier. (0 through 999)
5	0–15	**Motion Tolerance (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the weight change that will trigger the in-motion flag to be set. (0 through 999)
6	0–15	**Zero Tolerance (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the acceptable tolerance for zero weight. (0 through 999)
7	0–15	**Zero Tolerance (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the acceptable tolerance for zero weight. (0 through 999)
8	0–15	**#Samples** — The number of weight samples used to calculate the average current weight. Since an A/D conversion takes 50ms, the weight is sampled every 50ms. After each sample, the average is calculated based on the last number of samples as specified. (1 through 200)

word	bits	description
9	0–15	**Real-Time Sampling Period** — This value sets the period at which the module puts a new average weight value into the read block and turns on the new-data bit (bit 9 of word 0). If a real-time sample period has passed without a block-transfer read, the real-time sample period read-block time-out bit (bit 1 of word 0) in the status block is turned on. Enter the period value in milliseconds. (50 through 10,000 in increment of 50)
10	0–15	**Sensitivity (MSW) (Soft-Cal Only)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit full-scale voltage value as taken from the load-cell calibration data sheet for the load cell being used.
11	0–15	**Sensitivity (LSW) (Soft-Cal Only)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit full-scale voltage value as taken from the load-cell calibration data sheet for the load cell being used.
12	0–15	**Range (MSW) (Soft-Cal Only)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit weight-capacity value as taken from the load-cell calibration data sheet for the load cell being used. For multiple load cells, this is the range value generated by the calibration program.
13	0–15	**Range (LSW) (Soft-Cal Only)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit weight-capacity value as taken from the load-cell calibration data sheet for the load cell being used. For multiple load cells, this is the range value generated by the calibration program.
14	0–15	**Calibration Low Weight (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-LO reference point.
15	0–15	**Calibration Low Weight (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-LO reference point.
N140:116	0–15	**Calibration Midpoint-Linearization Weight (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the MID-LIN reference point. (Optional. Set to 0 if not used.)
16	0–15	**Calibration Midpoint-Linearization Weight (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the MID-LIN reference point. (Optional. Set to 0 if not used.)
17	0–15	**Calibration High Weight (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-HI reference point.
18	0–15	**Calibration High Weight (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-HI reference point.
19	0–15	**Calibration Low Volts (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-LO reference point. This data is used only when bit 1 of word 32 is on.
20	0–15	**Calibration Low Volts (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-LO reference point. This data is used only when bit 1 of word 32 is on.

word	bits	description
21	0–15	**Calibration Midpoint Linearization Volts (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format volts value calculated for the MID-LIN reference point. This data is used only when bit 1 of word 32 is on. (Optional. Set to 0 if not used.)
22	0–15	**Calibration Midpoint Linearization Volts (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format volts value calculated for the MID-LIN reference point. This data is used only when bit 1 of word 32 is on. (Optional. Set to 0 if not used.)
23	0–15	**Calibration High Volts (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-HI reference point. This data is used only when bit 1 of word 32 is on.
24	0–15	**Calibration High Volts (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-HI reference point. This data is used only when bit 1 of word 32 is on.
25	0–15	**Calibration Year** — This is the year in which the module was calibrated. (1994–2100)
26	0–15	**Calibration Month** — This is the month of the year in which the module was calibrated. (1–12)
27	0–15	**Calibration Day** — This is the day of the month in which the module was calibrated. (1–31)
28	0–15	**Calibration Identification (MSW)** — The two most-significant upper-case alpha-numeric (ASCII) characters representing the ID of the person who last calibrated this module.
29	0–15	**Calibration Identification (LSW)** — The two least-significant upper-case alpha-numeric (ASCII) characters representing the ID of the person who last calibrated this module.
30	0–15	**Number of Load points in C2-Cal** — This is the number of load points connected. It is used to verify that all of the load points were found during the automatic search for calibration data. (0 through 8)

word	bits	description
N140:131		**Calibration/Diagnostic Control** — Use these bits to calibrate the module, run diagnostics on the module, and control data storage in the non-volatile memory on the module.
	0	**Calibration Mode** — If you turn off this bit before you turn off the accept data bit (bit 7 of word 32) the new calibration is lost. •0 = Disable calibration mode. •1 = Enable calibration mode.
	1	**Restore Calibration Data** — This bit determines whether to use the calibration data in this block to restore calibration values regardless of the state of the accept data bit (bit 7 of word 32). Calibration data here refers to all calibration data including calibration-volts reference points. Using calibration data here refers to using old calibration data stored in the PLC data table to restore the calibration data on the module. •0 = Disable the writing of calibration restoration data into non-volatile memory. •1 = Enable the writing of calibration restoration data into non-volatile memory.
	2	**Hard/Soft Calibration** — This bit is relevant only if bit 1 is off. •0 = Hard calibration mode. •1 = Soft calibration or C2 calibration mode.
	3	**Soft-CalC2-Cal Mode** — This bit is relevant only if bit 1 is off and bit 2 is on. •0 = Set Soft-Cal mode. •1 = Set C2-Cal mode. The module will ignore the configuration block values for sensitivity and range.
	4	**Calibration-Low Read** •0 = Disable calibration-low read. •1 = Enable calibration-low read. The module sets the averages to 200, waits 12 seconds, reads the value from the scale, stores it as the calibration-low value, and uses it in conjunction with the calibration-low weight for the CAL-LO reference point. As long as this bit is on and the scale is not in motion, the module will read the calibration-low value continually.
	5	**Midpoint-Linearization Read (Optional)** •0 = Disable midpoint linearization read. •1 = Enable midpoint linearization read. The module sets the averages to 200, waits 12 seconds, reads the value from the scale, stores it as the midpoint linearization value, and uses it in conjunction with the midpoint linearization weight for the MID-LIN reference point. As long as this bit is on and the scale is not in motion, the module will read the midpoint linearization value continually.
	6	**Calibration-High Read** •0 = Disable calibration-high read. •1 = Enable calibration high read. The module sets the averages to 200, waits 12 seconds, reads the value from the scale, stores it as the calibration-high value, and uses it in conjunction with the calibration-high weight for the CAL-HI reference point. As long as this bit is on and the scale is not in motion, the module will read the calibration-high value continually.

word	bits	description
N140:131	7	**Accept Data** — For accepting new calibration data. •0 = Disable accept data. •1 = Enable accept data. If in calibration mode (bit 0), write CAL-LO, MID-LIN, and CAL-HI reference-point data to the module's non-volatile memory.
	8	**Read Load-Point Data in C2-Cal** •0 = Disable read load-point data. •1 = Enable read load-point data. Read the calibration data from all load-points found on the C2-Cal 2-wire bus and is used to automatically calculate the information for sensitivity and range for C2-Cal.
	9	**Read On-Board Resistance (Diagnostics Use Only)** — Use this bit to connect resistance across the sense and signal lines to isolate weight-reading problems. If the weight reading with this resistance connected is stable and repeatable, the input section of the module is functioning correctly. •0 = Disconnect on-board resistance. •1 = Connect on-board resistance.
	10	**Run Diagnostics** •0 = Disable on-board diagnostics. •1 = Run the module's on-board diagnostics. The module does not block-transfer while this is running.
33	0-15	**Setpoint 1 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format setpoint 1 value.
34	0-15	**Setpoint 1 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format setpoint 1 value.
35	0-15	**Setpoint 2 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format setpoint 2 value.
36	0-15	**Setpoint 2 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format setpoint 2 value.
37	0-15	**Deadband 1 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format deadband 1 value.
38	0-15	**Deadband 1 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format deadband 1 value.
39	0-15	**Deadband 2 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format deadband 2 value.
40	0-15	**Deadband 2 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format deadband 2 value.
41	0-15	**Preact 1 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format preact 1 value.
42	0-15	**Preact 1 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format preact 1 value.
43	0-15	**Preact 2 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format preact 2 value.
44	0-15	**Preact 2 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format preact 2 value.

Series B only

word	bits	description
N140:145	0-15	**SP Weight Description** — This word stores the unit of measure for weight in setpoint calculations: •0 = kilograms •1 = pounds
46	0-15	**RoC Time Units** — This word stores the unit of measure for time in rate-of-change calculations: •0 = seconds •1 = minutes •2 = hours
47	0-15	**RoC Evaluation Period** — This word stores the value for time over which a rate-of-change calculation is made. (1 millisecond - 32.767 seconds)
48	0-15	**RoC Weight Description** — This word stores the unit of measure for weight in rate-of-change calculations: •0 = kilograms •1 = pounds

Notes:

Monitoring Status Data

This chapter shows you how to monitor status data by reading information directly from the data table.

Reading Floating-Point Values

The gross weight and net weight values are available in 32-bit floating-point format in words 5 through 8. Since the status block must be in an integer file, each 32-bit floating-point value takes up two 16-bit integer words. To copy floating-point values into a floating-point file, use a COPY FILE instruction:

for this value	enter the
source	address of the first integer word (containing the 16 most-significant bits of the floating-point value)
destination	address of the floating-point word
length	length of the destination block being written to in 32-bit floating-point words To copy the gross and net weight values together, enter a length of 2.

Reading 6-Digit Integer Values

The status block contains 6-digit integer values. However, a 16-bit integer word has limits of –32,768 and +32,767. Therefore, 2 words are used for each 6-digit integer value. The 3 most-significant decimal digits are placed in natural binary format in one word, and the 3 least-significant decimal digits are placed in natural binary format in the other word.

For example, if the most-significant word has a value of 783 and the least-significant word has a value of 26, the total value is 783026. Unless the most-significant word has a value of zero, its sign must match that of the least-significant word or the value is invalid.

Implied Decimal Point

For all weight integer values, the decimal-point location is implied by the decimal-point-location value you select:

if you have selected the decimal-point location value of	0	1	2	3	4	5	6
the implied decimal point location would be	*xxxxxx.*	*xxxxx.x*	*xxxx.xx*	*xxx.xxx*	*xx.xxxx*	*x.xxxxx*	**0.***xxxxxx*

Status Block

Read the status block from the Weigh Scale Module using a block-transfer read instruction. The status block contains 64 words (listed below).

Words shaded gray in this table indicate that these words apply to double density (Series B) mode only.

Series B only

Terminology

If you need definitions of the Weigh Scale Module terms used in this chapter, see the Glossary at the end of this manual.

word	bits	description
0		**General Status and Error Bits**
	0	**Just Up** •0 = The module has received a block-transfer write since the last power-up or reset. •1 = The module has gone through a power-up or reset since it last received a block-transfer write.
	1	**Real-Time Sample Period BTR Time-out** •0 = A block-transfer read had been executed during the last real-time sample period. •1 = A real-time sample period has passed without a block-transfer read.
	2	**In Motion** — based on the motion tolerance value. •0 = The scale **is not** in motion. •1 = The scale **is** in motion.
	3	**Input Over Range** •0 = The input signal is not over range. •1 = The input signal differential is greater than can be measured accurately.
	4	**Input Under Range** •0 = The input signal is not under range •1 = The input signal differential is more negative than can be measured accurately.
	5	**Attempt to Set Tare While in Motion** •0 = Either the tare function is not active or the scale is not in motion. •1 = The tare function is active and the scale is in motion.
	6	**Attempt to Zero While in Motion** •0 = Either the zero function is not active or the scale is not in motion. •1 = The zero function is active and the scale is in motion.
	7	**Tare Successful** •0 = Either the tare function is not active, the scale is in motion, or the tare function was not successfully completed. •1 = The tare function was successfully completed.
	8	**Zero Successful** •0 = Either the zero function is not active, the scale is in motion, or the zero function was not successfully completed. •1 = The zero function was successfully completed.

word	bits	description
0	9	**New Data** •0 = The status-block data **has not** been updated by the module since the last block-transfer read. •1 = The status-block data **has** been updated by the module since the last block-transfer read.
	10	**Decimal-Point Location Error** •0 = The decimal-point location value is valid. •1 = An invalid value was entered for the decimal-point location.
	11	**#Samples Entry Error** •0 = The #Samples value is valid. •1 = An invalid value was entered for the number of samples.
	12	**Motion-Tolerance Entry Error** •0 = The motion-tolerance value is valid. •1 = An invalid value was entered for motion tolerance.
	13	**Zero-Tolerance Entry Error** •0 = The zero-tolerance value is valid. •1 = An invalid value was entered for zero tolerance.
	14	**Real-Time Sample Period Entry Error** •0 = The real-time sample period value is valid. •1 = An invalid value was entered for the real-time sample period.
	15	**WAVERSAVER Selection Error** •0 = Only one WAVERSAVER selection bit is on. •1 = Multiple WAVERSAVER selection bits are on.
1		**General and Soft Calibration Bits**
	0	**Not Calibrated** •0 = The current values in the non-volatile memory **are** valid calibration values. •1 = The current values in the non-volatile memory **are not** valid calibration values — the module is new (uncalibrated) or has bad non-volatile memory.
	1	**Calibration Mode** •0 = **Not** in a calibration mode. •1 = In a calibration mode.
	2	**Last Calibration Mode** •0 = The module was last calibrated in Hard-Cal mode. •1 = The module was last calibrated in either Soft-Cal or C2-Cal mode
	3	**Last Soft-Cal/C2-Cal Mode —** This bit is only valid if bit 2 is on. •0 = The module was last calibrated in Soft-Cal mode. •1 = The module was last calibrated in C2-Cal mode.
	4	**Write Successful** •0 = Write **not** successful. •1 = Write to non-volatile memory successful.
	5	**Current Calibration Mode** •0 = Set for Hard-Cal. •1 = Set for Soft-Cal or C2-Cal.
	6	**Current Soft-Cal/C2-Cal Mode —** This bit is only valid if bit 5 is on. •0 = Set for Soft-Cal mode. •1 = Set for C2-Cal mode.

word	bits	description
1	7	**Calibration Date or ID Error** •0 = No error •1 = An invalid value was entered for the calibration year, month, day, or identification.
	8	**Sensitivity Error** •0 = Sensitivity value is valid. •1 = Sensitivity value entered is invalid.
	9	**Range Error** •0 = Range value is valid. •1 = Range value entered is invalid.
	10	**Incorrect Load-Point Count in C2-Cal** •0 = The number of load points found during the read **matched** the number specified. •1 = The number of load points found during the read **did not match** the number specified.
	11	**Load-Point Error in C2-Cal** •0 = No load-cell error. •1 = Either no load points were found, or there was a communication error.
	12	**C2-Cal Read Complete** •0 = The load-point data has not yet been read, or errors were reported. •1 = The load-point data was read successfully, and no errors were reported.
	13	**Test-Resistance Value Failure** •0 = Test-resistance value **is** within tolerance of the test-resistance value taken at the factory. •1 = Test-resistance value **is not** within tolerance of the test-resistance value taken at the factory.
	14	**Restore Data Complete** •0 = Processing of values block-transferred to the module for restoring calibration data **is not** complete. •1 = Processing of values block-transferred to the module for restoring calibration data **is** complete. If no errors were found, the values have been loaded into the module's non-volatile memory. If errors were found, they have been reported with the error bits.
 Series B only	15	**EEPROM Failure** •0 = Successful write to EEPROM detected •1 = Unsuccessful write to EEPROM detected
2		**Hardware Calibration Bits**
	0	**Calibration Low-Weight Error** •0 = The CAL-LO reference weight value entered was **OK.** •0 = The CAL-LO reference weight value entered was **invalid.**
	1	**Midpoint Linearization Weight Error** •0 = The MID-LIN reference weight value entered was **OK.** •0 = The MID-LIN reference weight value entered was **invalid.**
	2	**Calibration High-Weight Error** •0 = The CAL-HI reference weight value entered was **OK.** •0 = The CAL-HI reference weight value entered was **invalid.**
	3	**Calibration Low Attempted with Scale in Motion** •0 = Scale not in motion during calibration low attempt. •1 = The calibration control "Calibration-Low-Read" bit was set on, and the scale was in motion.

word	bits	description
	4	**Midpoint Linearization Attempted with Scale in Motion** • 0 = Scale not in motion during midpoint linearization attempt. • 1 = The calibration control “Midpoint-Linearization-Read” bit was set on, and the scale was in motion.
2	5	**Calibration High Attempted with Scale in Motion** • 0 = Scale not in motion during calibration high attempt. • 1 = The calibration control “Calibration-High-Read” bit was set on, and the scale was in motion.
	6	**Midpoint Linearization to Low Difference Error** • 0 = The difference between the CAL-LO and MID-LIN reference points is **OK** (greater than 100). • 1 = The difference between the CAL-LO and MID-LIN reference points is **not** greater than 100.
	7	**Calibration High-to-Low Difference Error** • 0 = The difference between the CAL-LO and CAL-HI reference points is **OK** (greater than 100). • 1 = The difference between the CAL-LO and CAL-HI reference points is **not** greater than 100.
	8	**CAL-LO Successful** • 0 = The calibration-low read bit is off, or the the scale is in motion. • 1 = The values for the CAL-LO reference point have been successfully recorded.
	9	**MID-LIN Successful** • 0 = The midpoint-linearization read bit is off, or the the scale is in motion. • 1 = The values for the MID-LIN reference point have been successfully recorded.
	10	**CAL-HI Successful** • 0 = The calibration-high read bit is off, or the the scale is in motion. • 1 = The values for the CAL-HI reference point have been successfully recorded.
	11	**Calibration-Low Volts Error** • 0 = A calibration-low value was entered within the range of –1.0mV/V through +5.0V/V. • 1 = A calibration-low value of less than –1.0mV/V or greater than +5.0V/V was entered.
	12	**Midpoint-linearization Volts Error** • 0 = A midpoint-linearization value was entered within the range of –1.0mV/V through +5.0V/V. • 1 = A midpoint-linearization value of less than –1.0mV/V or greater than +5.0V/V was entered.
	13	**Calibration-High Volts Error** • 0 = A calibration-low value was entered within the range of –1.0mV/V through +5.0V/V. • 1 = A calibration-low value of less than –1.0mV/V or greater than +5.0V/V was entered.
	14	Reserved.
 Series B only	15	**Configuration-in-Change** — For the first seven seconds after the module is powered up, or when you change WAVERSAVER settings, the module reports a busy state. Do not attempt BTRs, BTWs, or try to access values.
3	0–15	**Gross Weight (16-bit Integer Format)** — This is the current average gross weight value. It can be in the range of –32,768 through +32, 767. Use this value in applications for which 16-bit resolution is adequate.
4	0–15	**Net Weight (16-bit Integer Format)** — This is the current average gross weight value. It can be in the range of –32,768 through +32, 767. Use this value in applications for which 16-bit resolution is adequate.

word	bits	description
5	0–15	**Gross Weight (32-bit Floating-Point Format) (MSW)** — This is the most-significant 16 bits of the current average gross weight value in 32-bit floating-point format.
6	0–15	**Gross Weight (32-bit Floating-Point Format) (LSW)** — This is the least-significant 16 bits of the current average gross weight value in 32-bit floating-point format.
7	0–15	**Net Weight (32-bit Floating-Point Format) (MSW)** — This is the most-significant 16 bits of the current average net weight value in 32-bit floating-point format.
8	0–15	**Net Weight (32-bit Floating-Point Format) (LSW)** — This is the least-significant 16 bits of the current average net weight value in 32-bit floating-point format.
9	0–15	**Calibration Year** — This is the year in which the module was calibrated. (1994–2100)
10	0–15	**Calibration Month** — This is the month of the year in which the module was calibrated. (1–12)
11	0–15	**Calibration Day** — This is the day of the month in which the module was calibrated. (1–31)
12	0–15	**Calibration Identification (MSW)** — The two most-significant alpha-numeric (ASCII) characters representing the ID of the person who last calibrated this module.
13	0–15	**Calibration Identification (LSW)** — The two least-significant alpha-numeric (ASCII) characters representing the ID of the person who last calibrated this module.
14	0–15	**Calibration Low Weight (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-LO reference point.
15	0–15	**Calibration Low Weight (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-LO reference point.
16	0–15	**Calibration High Weight (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-HI reference point.
17	0–15	**Calibration HIgh Weight (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-HI reference point.
18	0–15	**Calibration Midpoint-Linearization Weigh (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the MOD-LIN reference point. (Optional)
19	0–15	**Calibration Midpoint-Linearization Weigh (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the MOD-LIN reference point. (Optional)
20	0–15	**Calibration Low Volts (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-LO reference point.
21	0–15	**Calibration Low Volts (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-LO reference point.
22	0–15	**Calibration High Volts (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-HI reference point.
23	0–15	**Calibration High Volts (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-HI reference point.

word	bits	description
24	0–15	**Calibration Midpoint Linearization Volts (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format volts value calculated for the MID-LIN reference point. (Optional)
25	0–15	**Calibration Midpoint Linearization Volts (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format volts value calculated for the MID-LIN reference point. (Optional)
26	0–15	**Test Resistance Values (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of a 6-digit raw input value for testing the module and troubleshooting the system.
27	0–15	**Test Resistance Values (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of a 6-digit raw input value for testing the module and troubleshooting the system.
28	0–7	**Firmware Revision** — In ASCII. (A through Z)
	8–15	**Firmware Series** — In ASCII. (A through Z)
29	0	**Double Density Mode** — This word stores the jumper (J1) location: •0 = The module is in single-density (Series A) mode. •1 = The module is in double-density (Series B) mode.
29	1	**Setpoint Weight Descriptor Error** •0 = Valid value entered for setpoint weight description. •1 = Value entered for setpoint weight description is invalid. Valid values are 0 (kilograms) and 1 (pounds).
	2	**Setpoint Value Error** •0 = Valid value entered for setpoint. •1 = Value entered for setpoint is invalid. Valid values are -999999 through 999999.
	3	**Deadband Value Error** •0 = Valid value entered for deadband. •1 = Value entered for deadband is invalid. Valid values are -999999 through 999999.
	4	**Preact Value Error** •0 = Valid value entered for preact. •1 = Value entered for preact is invalid. Valid values are -999999 through 999999.
	5	**Setpoint Setup Error** •0 = Valid setpoint setup. •1 = Improper configuration of setpoint, preact, and deadband.
	6	**RoC Weight Descriptor Error** •0 = Valid value entered for RoC weight description. •1 = Value entered for RoC weight description is invalid. Valid values are 0 (kilograms) and 1 (pounds).
	7	**RoC Evaluation Period Error** •0 = Valid value entered for RoC evaluation period. •1 = Value entered for RoC evaluation period is invalid. Valid values are 1 millisecond through 32.767 seconds.
	8	**RoC Units Error** •0 = Valid value entered for RoC units. •1 = Value entered for RoC unit is invalid. Valid values are 0 (seconds), 1 (minutes), and 2 (hours).
	9-15	Reserved.

word	bits	description
30	0-15	**Setpoint 1 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format setpoint 1 value. This data is used only when bit 0 of word 29 is on.
31	0-15	**Setpoint 1 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format setpoint 1 value. This data is used only when bit 0 of word 29 is on.
32	0-15	**Setpoint 2 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format setpoint 2 value. This data is used only when bit 0 of word 29 is on.
33	0-15	**Setpoint 2 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format setpoint 2 value. This data is used only when bit 0 of word 29 is on.
34	0–15	**Deadband 1 (MSW)** – This is the most-significant 16 bits of the 32-bit floating-point format deadband 1 value. This data is used only when bit 0 of word 29 is on.
35	0–15	**Deadband 1 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format deadband 1 value. This data is used only when bit 0 of word 29 is on.
36	0–15	**Deadband 2 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format deadband 2 value. This data is used only when bit 0 of word 29 is on.
37	0–15	**Deadband 2 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format deadband 2 value. This data is used only when bit 0 of word 29 is on.
38	0–15	**Preact 1 (MSW)** – This is the most-significant 16 bits of the 32-bit floating-point format preact 1 value. This data is used only when bit 0 of word 29 is on.
39	0–15	**Preact 1 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format preact 1 value. This data is used only when bit 0 of word 29 is on.
40	0–15	**Preact 2 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format preact 2 value. This data is used only when bit 0 of word 29 is on.
41	0–15	**Preact 2 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format preact 2 value. This data is used only when bit 0 of word 29 is on.
42	0–15	**SP Weight Description** – This word stores the unit of measure for weight in setpoint calculations: •0 = kilograms •1 = pounds
43	0–15	**RoC Time Units** – This word stores the rate-of-change in time units: •0 = seconds •1 = minutes •2 = hours
44	0–15	**RoC Evaluation Period** — This word stores the value for time over which a rate-of-change calculation is made. (1 millisecond - 32.767 seconds)
45	0–15	**RoC Weight Description** – This word stores the unit of measure for weight in rate-of-change calculations: •0 = kilograms •1 = pounds
46	0–15	**RoC Calculation (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format RoC value. This data is used only when bit 0 of word 29 is on.
47	0–15	**RoC Calculation (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format RoC value. This data is used only when bit 0 of word 29 is on.

word	bits	description
48	0–15	**Calibration/Diagnostics Control** — This word stores calibration and diagnostic information that you view on the active window for configuration verification.
49	0–15	**Decimal Point Location** — This word stores the number of digits to the right of the decimal point for all weight integer values.
50	0–15	**Motion Tolerance (MSW)** — This word stores the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the weight change that will trigger the in-motion flag to be set . You entered this value on the Configuration screen.
51	0–15	**Motion Tolerance (LSW)** — This word stores the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the weight change that will trigger the in-motion flag to be set. You entered this value on the Configuration screen.
52	0–15	**Number of Averages** — This word stores the number of weight samples used to calculate the average current weight that you entered on the Configuration screen.
53	0–15	**Number of Load Cells** — This word stores the number of load cells that you entered on the Calibration screen.
54	0–15	Reserved.
55	0–15	Reserved.
56	0–15	**Real-time Sample Period** — This word stores the period at which the module puts a new average weight value into the read block and turns on the new-data bit. You entered this value on the Configuration screen.
57	0–15	Reserved.
58	0–15	Reserved.
59	0–15	**WAVERSAVER Selection** — This word stores the lowest frequency you want to reject. You entered this value on the Configuration screen.
60	0–15	**Weight Functions** — This word stores the tare-enable and zero-enable values you selected on the Configuration screen.
61	0–15	**Weight Modes** — This word stores the value (lb. or kg.) that you selected on the Configuration screen.
62	0–15	**Zero Tolerance (MSW)** — This word stores the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the acceptable tolerance for zero weight. You entered this value on the Configuration screen.
63	0–15	**Zero Tolerance (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the acceptable tolerance for zero weight. You entered this value on the Configuration screen.

Notes:

Specifications

I/O Chassis Location	any single I/O module slot
Compatible I/O Chassis	1771-A1B, -A2B, -A3B, -A3B1, -A4B, 1771-AM1, -AM2
Number of Input Image Bits •Single density (Series A) •Double density (Series B)	 •8 •16
Number of Output Image Bits •Single density (Series A) •Double density (Series B)	 •8 •16
Number of Read-Block Words •Single density (Series A) •Double density (Series B)	 •29 •64
Number of Write-Block Words •Single density (Series A) •Double density (Series B)	 •33 •49
Inputs	•sense ±5V dc ±5% (10V dc ±5% differential) •signal –0.3mV through +30.3mV dc •C2-Cal
Outputs	•excitation 10V dc ±5% 1.5W (maximum)
A/D Conversion Period	50 ms
Resolution: •Reported •Internal	 •1:985,000 (for 3mV/V load cell) •1:656,000 (for 2mV/V load cell) •1:1,048,576
Non-Linearity	0.0040% of full scale (maximum)
Common-Mode Rejection	100dB at or below 60Hz (minimum)
Common-Mode Voltage Range	±2.5V dc
Continuous Input Voltage	40.0V dc (maximum)
Offset Drift	Typical: 100nV/°C Maximum: 300nV/°C
Gain Drift	Typical: 3 ppm/°C Maximum: 13 ppm/°C
Electrical Isolation between I/O circuits and backplane logic circuitry	1,000V
Max Backplane Current Load	1.5A

Conductors **Wire Size** **Category**	per load-cell manufacturer's specification, in a stranded-conductor shielded cable [1]
Environmental Conditions: • Operating Temperature • Storage Temperature • Relative Humidity	 • 0 to 60°C (32 to 140°F) • –40 to 85°C (–40 to 185°F) • 5 to 95% (without condensation)
Keying	Between 24 and 26 Between 32 and 34
Remote-Termination-Panel Choice	1771-RT44
Connecting Cable(s)	1771-NC6 = 1.8m (6 ft) 1771-NC15 = 4.6m (15 ft)
Agency Certification (when product or packaging is marked)	CE – marked for all applicable directives

1 You use this conductor-category information for planing conductor routing as described in the system-level installation manual.

Understanding 1771-WS Terminology

This glossary defines terms that we use throughout the Weigh Scale Module (Cat. No. 1771-WS) User Manual, publication 1771-6.5.117.

auto zero

Tells the module to set the gross weight value equal to zero when the weight on the scale is within zero tolerance and the scale is not in motion. This resets the zero weight of the scale.
See also gross weight display, net weight display, zero tolerance.

block transfer

The main means of communication between the PLC processor and the module. Transfers a block (64 words maximum) of data to and from an I/O module.

block transfer read address

Starting address of the data table file where status data is stored after being block transferred from the module. This address is assigned by the user and read by WeighScale Configuration software during calibration.

block transfer write address

Starting address of the data table file where configuration and calibration data is stored before being block transferred to the module. This address is assigned by the user and read by WeighScale Configuration software during calibration.

C2 calibration

A calibration technique that uploads calibration data from Hardy Instruments' C2 second-generation load cells. This calibration data lets the software automatically calibrate the module.
See also calibration, hard calibration, soft calibration.

calibration

Sets gain/range data in the module for a given load cell to convert input information to a weight. You must configure the module before you can calibrate or use it. The Weigh Scale module supports the three basic types of calibration:

- hard – expects you to manually put weights on the scale to calibrate it.
- soft – expects you to enter the scale sensitivity and output resistance for each load cell.
- C2 – uploads calibration data from Hardy Instruments' C2 second-generation load cells.
  See also C2 calibration, hard calibration, soft calibration.

Calibration screen

Use this WeighScale Configuration software screen to interact with the module to calibrate your scale.

configuration

Establishes basic module operation. You must configure the module before you can calibrate or use it. Your selections do not take effect until you download them to the PLC data table.
See also download/upload.

Configuration screen

Use this WeighScale Configuration software screen to interact with the module to configure your module.

deadband

Used to separate the "turn-off" weight from the setpoint, preventing switching "chatter."

download/upload

Refers to the reading and writing of blocks of data from one device to another. When data is transferred to a device, it's considered an upload; when data is transferred from a device, it's considered an download.

gross weight display

Tells you the total weight of the vessel being measured.
See also net weight display.

hard calibration

Expects you to manually put weights on the scale to calibrate it.
See also C2 calibration, calibration, soft calibration.

high calibration weight

High reference point for hard calibration. Equal to the high weight being placed on a scale. Should be equal to 80 – 90% of scale capacity.
See also hard calibration.

in-motion tolerance

Tells the module what amount of weight change will indicate that there has been a change in the weight value.

low calibration weight

Low reference point for hard, soft, and C2 calibration. Equal to the low weight being placed on the scale.
See also C2 calibration, hard calibration, soft calibration.

midpoint linearization weight

Middle reference point for hard calibration, if the scale needs to be calibrated for linear operation.
See also hard calibration.

Module List screen

This WeighScale Configuration software screen displays the modules in the project and lets you modify already existing modules or add new modules to the list.

net weight display

Tells you the difference between the gross weight and the tare value. *See also gross weight display, tare value.*

number-of-digits selection

Number of digits displayed to the right of the decimal point.

number-of-samples selection

Number of weight samples module uses to calculate the average current weight.

on-board resistance

Disconnects the module input (i.e., stops the module from reading weight values from the scale) and forces the internal millivolt signal to 0 millivolts. This is used to detect drift in the module.

preact

Used to account for delay in shutting of feeders in the weighing system due to mechanical delays, material in flight, or other system delays.

PLC address

Node number on the DH+ link of the PLC-5 processor for the module.

Project screen

This screen is the first screen you see when you start WeighScale Configuration software. From this screen, you can:

- create new projects
- open, rename, copy, delete, and print files
- view a list of files and projects
- change the order in which files are listed
- access the Security System screen
- go to the Module List screen
- login and logout of the system

rate-of-change value

The rate-of-change represents the rate-of-change in weight as measured by the module over a defined time period. Can be used to track material flow. This calculation is based on three parameters:

- **weight description** — defines the unit of measure for weight in rate-of-change calculations
- **time units** — unit of measure for time in rate-of-change calculations
- **evaluation period** — the time over which a rate-of-change calculations are made

real-time sampling period

Tells the PLC processor how often to read the weight value from the module. Used to provide a consistent change over time (Δ/T) n the weight sample.

scale sensitivity

Voltage value. You get this value from the load cell supplier (typically from the load cell certificate). This value is used to calibrate the module.

setpoint

The value or target value for turning feeders on and off. The WeighScale Module supports two setpoints. Each setpoint is made up of:

- **weight description** — defines the unit of measure for weight in setpoint calculations
- **setpoint value** — target weight value
- **deadband** — used to separate the “turn-off” weight. At the actual switching point, the deadband also prevents switching “chatter”
- **preact value** — accounts for delay in the weighing system due to mechanical delays, material in flight, or other system delays

soft calibration

A method of calibration that eliminates the use of weights. This method expects you to enter the scale sensitivity and output resistance for each load cell. You get these values from the load cell supplier (typically from the load cell certificate).
For an accurate calibration, the scale sensitivity value must be to four digits to the right of the decimal point, and the output resistance value must be to digit to the right of the decimal point.
See also calibration, C2 calibration, hard calibration.

tare

Equal to the gross weight when you tare the scale.
See also gross weight display, tare enable selection.

tare enable selection

Sets or resets the net weight equal to zero.
See also net weight display.

unit-of-weight selection

Tells you whether the weight is currently displayed in pounds or kilograms.

WAVERSAVER setting

Sets the input noise frequencies to reject. Only noise at frequencies below this value will be rejected. This helps minimize process noise and give you a more stable weight reading.

zero-enable selection

Sets the gross and net weight values to zero.
See also gross weight display, net weight display.

zero-tolerance selection

If the current weight is less than this value and the in-motion tolerance is turned off, you can set the gross weight and net weight to zero using the auto-zero function or the zero-enable function.
See also auto-zero, gross weight display, net weight display, zero-enable selection.

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Allen-Bradley
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